Alberta Cancer Board

EPIDEMIOLOGY, PREVENTION AND SCREENING

Cancer in Alberta
A Regional Picture

July 2001

Alberta Cancer Board

ABOUT THE ALBERTA CANCER BOARD

Facilities and Services

The Alberta Cancer Board is a Provincial Health Authority operating cancer facilities and programs in Alberta. Services include cancer prevention, early detection, diagnosis, treatment, research and education. Also included in this role is coordinating in cooperation with others, the planning, development and delivery of provincial cancer initiatives.

As part of this mandate the Alberta Cancer Board operates:

- **Cancer treatment and research facilities:** Cross Cancer Institute in Edmonton and Tom Baker Cancer Centre in Calgary
- **Associate Cancer Centres:** Grande Prairie, Lethbridge, Red Deer and Medicine Hat
- **Community Cancer Centres** (in partnership with RHAs)**:** Headwaters RHA 3 in High River, RHA 5 in Drumheller, East Central RHA 7 in Camrose, WestView RHA 8 in Hinton, Aspen RHA 11 in Barrhead, Lakeland RHA 12 in Bonnyville, Peace RHA 14 in Peace River and Northern Lights RHA 16 in Fort McMurray
- **Division of Epidemiology, Prevention and Screening:**
  - **Population Health Research:** conducts research into population-based trends in cancer incidence, morbidity and mortality, the causes of cancer, prevention strategies and the early detection of cancer
  - **Alberta Cancer Registry:** a population-based registry of cancer cases in the province
  - **Screen Test: Alberta Program for the Early Detection of Breast Cancer:** a screening mammography and breast health education program with fixed-site offices in Calgary and Edmonton and mobile mammography services throughout the province
  - **Cancer Prevention Outreach:** provides a variety of services to RHAs, including cancer information, assistance with program and policy development and linkages to resources

The Alberta Coordinating Council for Cancer Control

The Alberta Cancer Board participates in the Alberta Coordinating Council for Cancer Control to connect cancer control efforts around the province and bring cancer services closer to home. The Cancer Coordinating Council extends the Alberta Cancer Board's expertise in cancer control programs (including prevention, screening, diagnosis, treatment, supportive and palliative care), cancer epidemiology and cancer research to urban and rural communities through collaboration with Regional Health Authorities and others.

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July 2001

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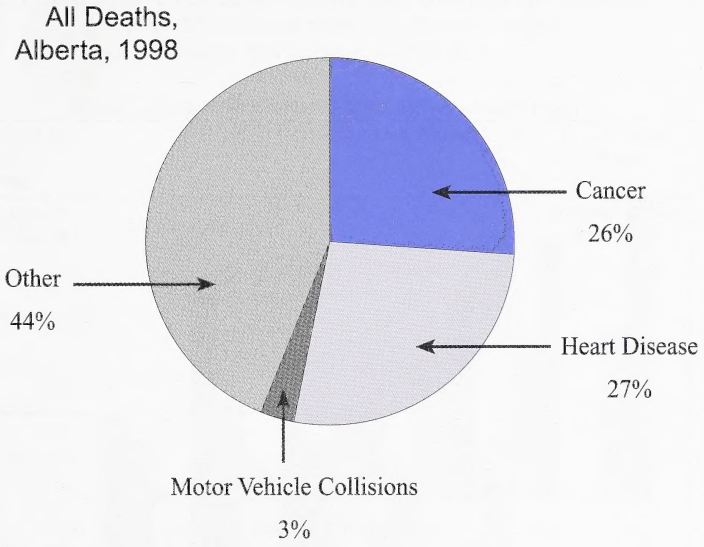
PREFACE

The Division of Epidemiology Prevention and Screening is pleased to provide Cancer in Alberta: A Regional Picture. This publication is the third in a series of annual reports presenting data from our Alberta Cancer Registry, cancer trends and regional rates. It aims to provide health professionals and planners in Alberta's Regional Health Authorities with detailed information about common cancer sites to assist in priority setting and decision-making. Cancer is the second leading cause of death in Albertans, shown below.[1]



The Alberta Cancer Registry registered almost 10,000 new cases of invasive cancer (excluding nonmelanoma skin cancer) per year in 1996, 1997 and 1998. Over 4,000 people died of cancer per year in that period. To date detailed statistics have been compiled through 1998. The data in this report are generally presented as three year moving averages (therefore the data presented for 1997 are an average of 1996 – 1998).

For a better understanding of the statistical information read Understanding the Graphs located immediately following the Preface.

Alberta statistics are contained in the bound portion of the publication. The Alberta data are organized by cancer site. Region specific data are located in the pocket inside the back cover. New this year to the Region specific data are two tables that discuss the summary of deaths due to cancer for each RHA as well as the summary of deaths of Alberta residents due to cancer for each RHA.

The Technical Report gives details on data collection and coding. For more information contact Ellen Murphy at the Alberta Cancer Board at (403) 670-4862 or at ellenmu@cancerboard.ab.ca.

[1] Government of Alberta, *Alberta Vital Statistics* - Annual Review

UNDERSTANDING THE GRAPHS

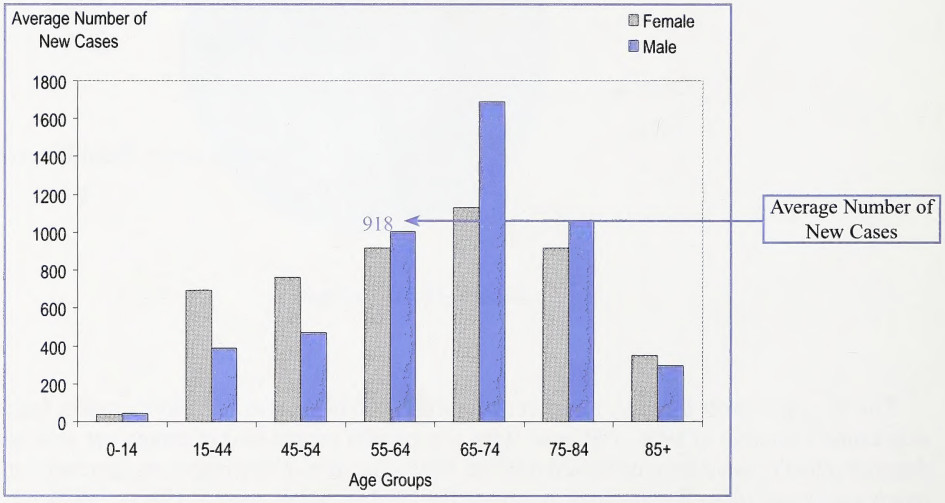
The examples below are given to aid in interpreting the graphs.

Average Number of New Cases

When only one year of data is shown, it is presented as a three-year average. For example in the graph below, the average number of new cases for all invasive cancers in females in the 55-64 year old age group in 1997 is 918 cases, an average of the number of cases in 1996, 1997 and 1998.

(Note: The number of deaths is also presented as a three-year average and calculated in the same manner as new cases. Age-specific incidence and mortality rates are also presented as three-year averages.)

New Cases by Selected Age Groups for All Invasive Cancers,
Alberta 1997 (average of 1996-1998)



Age-Specific Incidence Rates

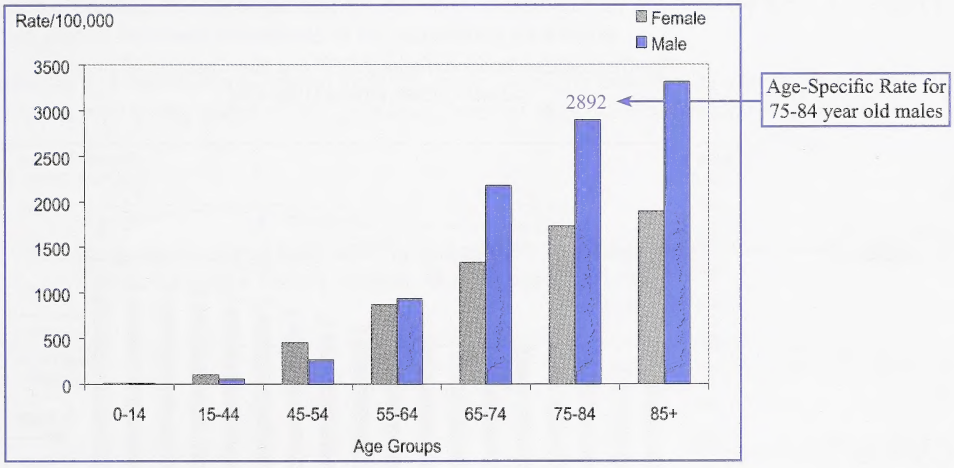
Age-specific incidence rates are used to compare the incidence of cancer among age groups. Age-specific incidence rates indicate the number of new cases that occur during a year in a specific age group, expressed as a rate per 100,000 persons in that age group.

The bars on the graph (located on the facing page) indicate the age-specific rates for all invasive cancers in Alberta for 1997. The age-specific rate for all invasive cancers in 75-84 year old Alberta males in 1997 was 2892 cases per 100,000.

Usually the incidence of cancer varies sharply across age groups. Note that the incidence for all invasisve cancer is much higher in men in the 65-74, 75-84 and 85+ age groups compared with the younger age groups. In this report, age-specific graphs are only used in the first section - *All Cancers.*

(Note: Age-Specific Mortality Rates are expressed in the same manner)

Age-Specific Incidence Rates for All Invasive Cancers,
Alberta 1997 (average of 1996-1998)



Age-Standardized Incidence Rates

Age-standardized incidence rates (ASIR) are used to compare cancer rates among populations and to identify trends by comparing the population distribution to an established population that results in the number of cases per 100,000. Alberta's population is aging and cancer incidence rates rise with age, therefore the number of cases of cancer is increasing. It is important to note that the increased number of cases does not mean that the rate of cancer is increasing. Comparing the number of cases of cancer in the younger and smaller 1980 population to the older and larger 1997 population gives an indication of the increased burden on the health care system, but does not indicate trends in the underlying disease rates.

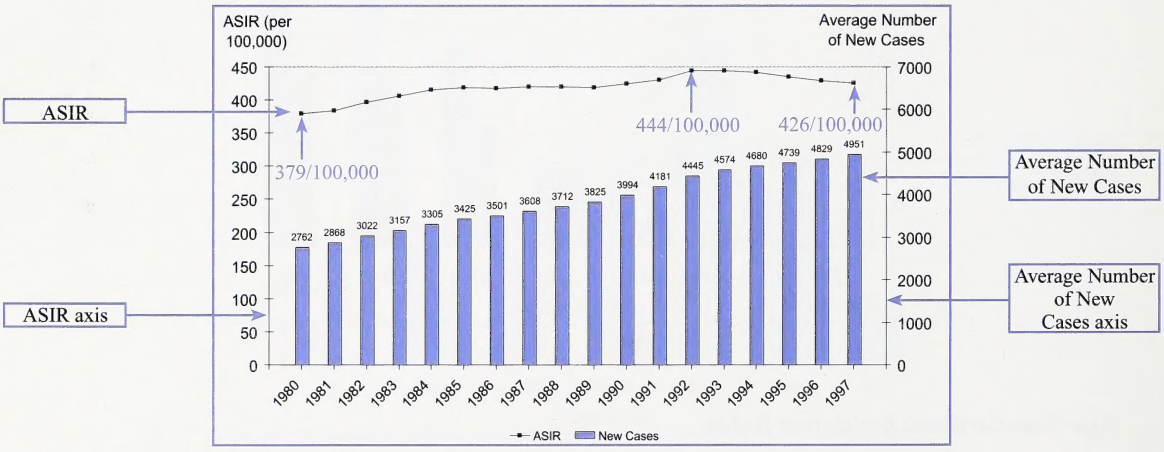
ASIR are rates that are adjusted to account for changes in the size and age distribution of the population from year to year. To calculate ASIR, the actual rates (age-specific rates) of cancer in the Alberta population are applied to a standard population (the 1991 Canadian population). For example, the rate of cancer in each age group for 1980 in Alberta is applied to the 1991 Canadian population to determine the 1980 ASIR.

Note on the graph below that the number of new cases for all invasive cancers in males increased from 2762 in 1980 to 4951 in 1997 as indicated on the blue bars. This is a substantial increase and has a major impact on the resources needed to care for patients with cancer. Using ASIR (the incidence rate for all invasive cancers in males standardized to the 1991 Canadian population) we see an increase from 379/100,000 in 1980, which peaked at 444/100,000 in 1992, and then decreased to 426/100,000 in 1997.

The 1991 Canadian population is used as the standard population in the calculation of ASIR in this document. It is also generally used as the standard population for Canadian and other provincial reports, except for those produced by Alberta Health and Wellness which use the 1996 Canadian population.

(Note: Age-Standardized Mortality Rates are standardized in the same manner)

Age-Standardized Incidence Rates (ASIR)* and New Cases for All Invasive Cancers, Males, Alberta (1980-1997)



*Three-year moving averages

Three-Year Moving Averages

ASIR (age-standardized incidence rates) and ASMR (age-standardized mortality rates) are presented in this document as three-year moving averages. To calculate a three-year moving average for the frequency of the event, the annual frequencies are summed for three years, centered on the year of interest and divided by three. For example, the number of cases for all invasive cancers in Alberta men in 1997 is calculated by adding the total number of invasive cancers that occurred in 1996-1998 inclusive, then dividing by three. As shown on the ASIR graph above, there were an average of 4951 cases of invasive cancers in Alberta men in 1997.

Moving averages are used to smooth out year-to-year fluctuations so that the underlying trend may be more easily observed. Moving averages are important to use when the numbers of cancer in each year are relatively small; in this situation year-to-year variability can be relatively large.

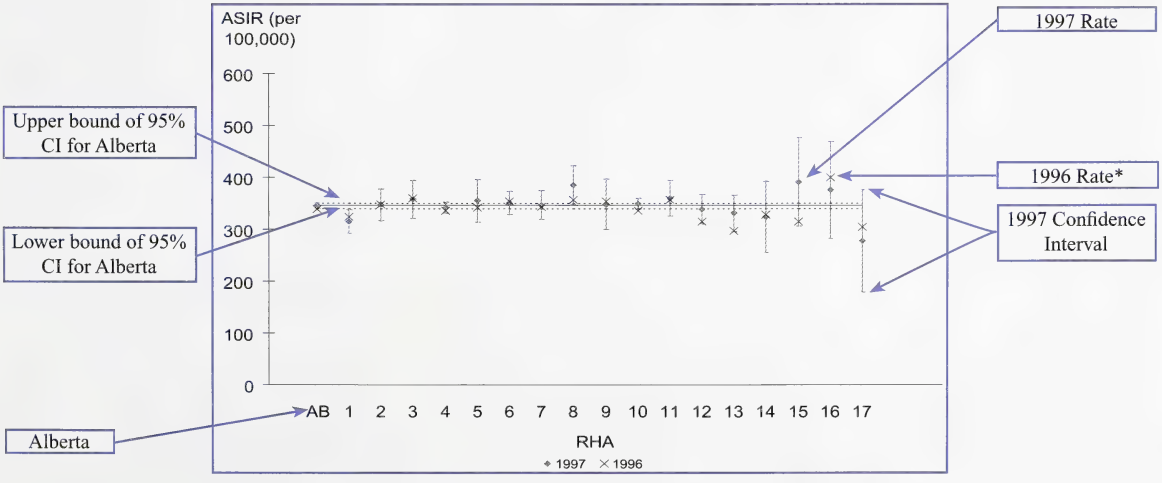
Confidence Intervals

A confidence interval (CI) indicates the precision of an estimate. In the figure below, the solid diamond represents the 1997 rate and the X represents the 1996 rate. The bars extending from the solid diamond indicate the confidence interval for the 1997 rate. Confidence intervals are partly a function of the population size; as the population size increases CIs narrow. Wide CIs indicate less precision and occur when the population size is smaller.

Note for example, the wider CIs for Regions 15, 16 and 17 in the graph below. These RHAs have relatively small populations. Large populations are less prone to variation due to chance than small populations, and therefore produce narrower confidence intervals. Consequently, the Alberta CI is narrower than those of the regions. The age-standardized rate for Alberta is dominated by the rates for RHA 4 (Calgary) and RHA 10 (Capital), which represent two-thirds of the population of Alberta.

In order to evaluate the age-standardized rate of an RHA, note should be taken of the variability of the rates among the RHAs, as well as the width of the confidence interval. Age-standardized rates should be monitored over time.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for All Invasive Cancers, Females, 1997 (average of 1996-1998)

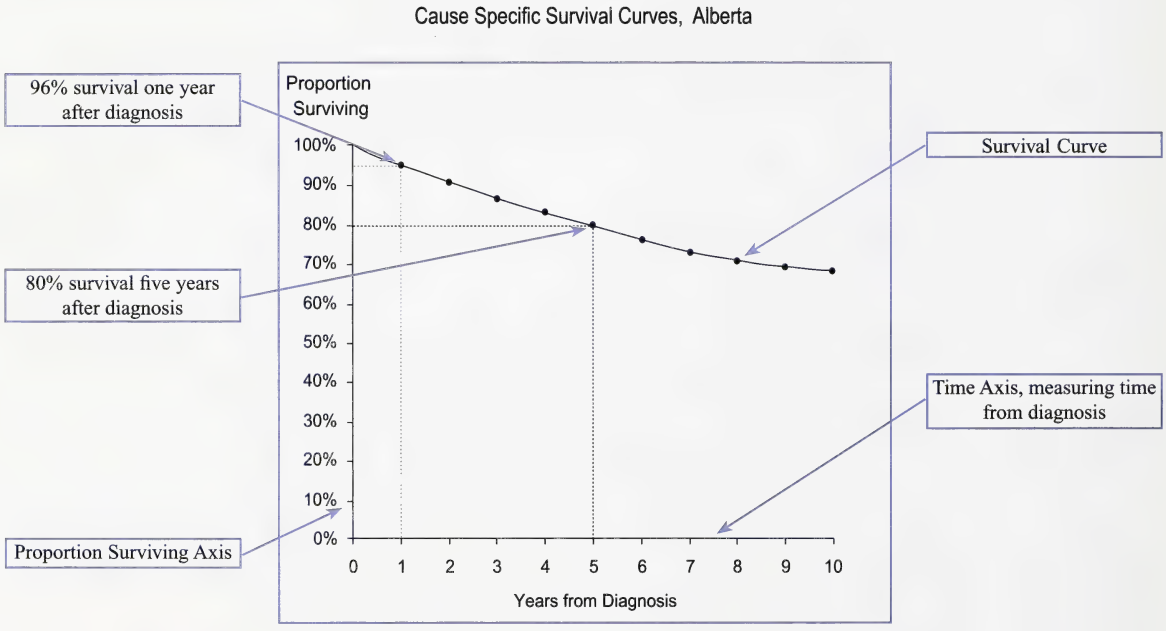


* 1996 Rate is an average of 1995-1997

Survival Curves

Survival curves are used to describe the length of time from a diagnosis of cancer until death. The curves represent the fraction of people still alive after a period of time. For example, after one year, 96% of females diagnosed with breast cancer are still alive. After five years, 80% are still alive.

Survival curves can be used to compare survival outcomes between different groups (by sex, by cancer site). The higher the survival curve, the better the survival rates for that cancer. Survival curves are only presented in the first section - *All Cancers*.



Cancer in Alberta

A Regional Picture

Alberta

Data

THE BIGGER PICTURE - POPULATION

Alberta's population continues to grow - the population has increased 33 per cent between 1980 and 1997. Alberta is divided into 17 RHAs identified by number and name as shown on the map on the next page. The populations of the RHAs vary dramatically. RHA 4, the largest RHA, has a population almost 50 times RHA 17, the smallest RHA. This population variation affects the precision of regional data presented in this report. The incidence and mortality data from the larger regions can be calculated with more precision than that of the smaller regions.

Alberta's population is also aging, thus the number of new cases and deaths from cancer is increasing because cancer is more likely to develop with age. The proportion of Alberta's population 65 years and older increased from approximately seven per cent in 1980 to just over 10 per cent in 1997. Over 55 per cent of new invasive cancers occur in this group, highlighting the importance of this age group in determining cancer burden.

Alberta and Its RHAs: Population and New Cases of Invasive Cancer 1997 (average of 1996-1998)

	Population		New Cases of Invasive Cancer				
	Total	% 65yrs & over	0-14 yrs	15-64 yrs	65+ yrs	Total	NMSC*
Alberta	2,789,939	10.1%	83	4234	5443	9760	4304
RHA 1	145,997	12.9%	3	214	377	594	360
RHA 2	86,914	12.9%	2	134	212	348	137
RHA 3	69,205	10.2%	3	102	138	243	123
RHA 4	858,509	9.0%	23	1319	1474	2816	1425
RHA 5	51,807	12.5%	3	82	127	212	97
RHA 6	180,241	10.8%	8	273	390	671	286
RHA 7	102,866	14.6%	2	156	294	452	187
RHA 8	87,903	7.4%	5	141	136	282	99
RHA 9	38,955	10.4%	2	61	83	146	45
RHA 10	791,123	10.5%	22	1234	1577	2833	1157
RHA 11	81,129	10.2%	2	127	166	295	91
RHA 12	106,099	11.5%	1	154	247	402	129
RHA 13	86,553	7.9%	3	112	129	244	85
RHA 14	20,218	9.3%	0	26	39	65	17
RHA 15	25,441	5.4%	2	31	27	60	10
RHA 16	38,341	2.0%	1	56	15	72	13
RHA 17	18,638	3.6%	2	12	9	23	5

*NMSC = Nonmelanoma skin cancer; these cases have not been included in the total

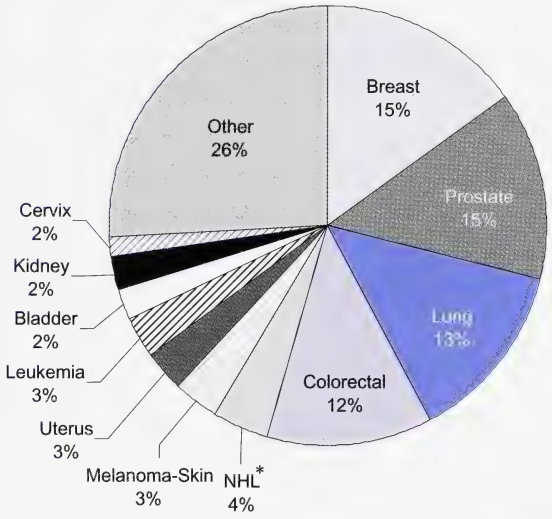
THE BIGGER PICTURE - RHA MAP

Alberta's Regional Health Authorities by Name and Number

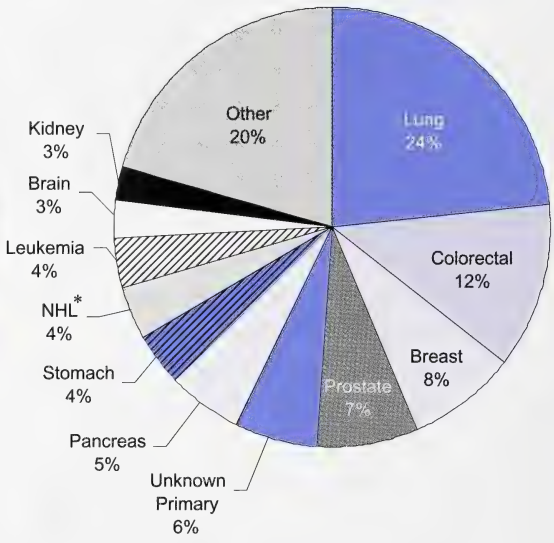
ALL CANCERS - DISTRIBUTION

New Invasive Cancers and Deaths by Site, Alberta, 1998

New Invasive Cancers by Site, Alberta, 1998



Cancer Deaths by Site, Alberta, 1998



There are over 200 different types of cancer. The most common invasive cancers are depicted in the pie charts above. The top four cancers in 1998 were breast, prostate, lung and colorectal. These four cancers were responsible for over 50 per cent of new cancers and cancer deaths in 1998. The *Other* category for new invasive cancers includes cancers that accounted for less than two per cent each of the total number of cancers, and the *Other* category for cancer deaths includes cancers that caused less than three per cent each of cancer deaths.

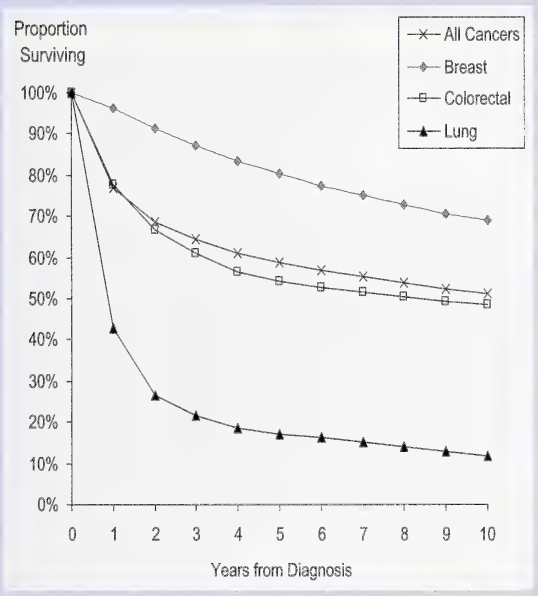
There are three cancers – pancreas, stomach and brain, that were responsible for 12 per cent of the deaths in 1998, but were not individually identified in the pie chart to the left because they each accounted for less than two per cent of the new cases. The reason for this difference is these cancers can have a poorer prognosis and therefore contribute more strongly to the mortality figures than other cancers.

*Non-Hodgkin's Lymphoma

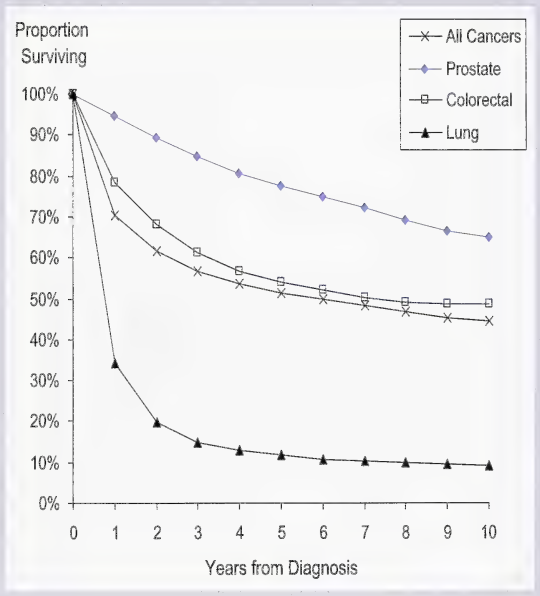
All Cancers - survival curves

Cause Specific Survival Curves, Alberta (cases diagnosed 1988-1994)*

Female Cancers



Male Cancers



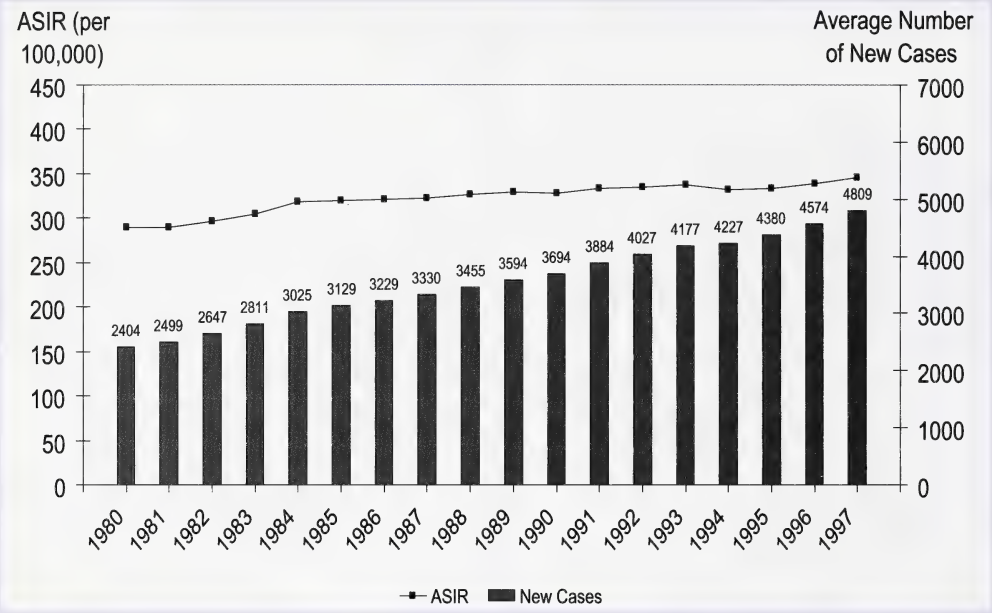
The number of years of survival after diagnosis of cancer depends on several factors. Survival is determined by the stage of cancer at diagnosis, type of cells affected, age at diagnosis and treatment.

Survival after breast or prostate cancer decreases at a more constant rate than either that of lung or colorectal cancer. Five and ten year survival rates for breast and prostate cancers are better overall than for lung and colorectal cancers.

*Those cases not known to be dead were censored either at the date they left the province or March 31, 1999

ALL CANCERS - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for All Invasive Cancers**, Females, Alberta (1980-1997)



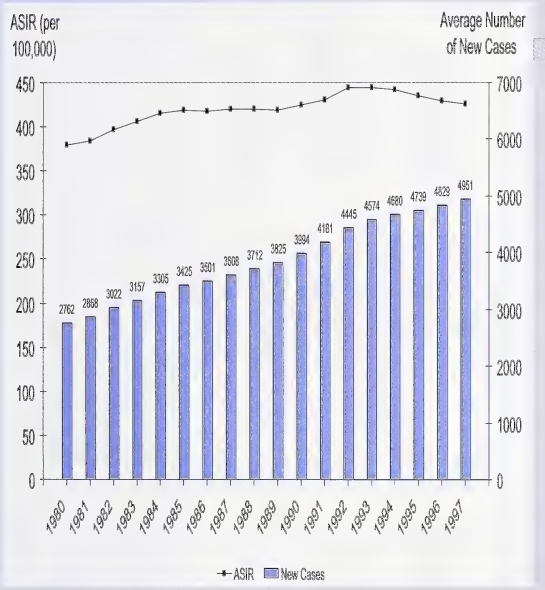
*Three year moving averages

Age-standardized rates of cancer incidence in women have remained relatively stable since 1980, as large increases in lung cancer have been offset by declining or stable rates for most other forms of cancer. The most common types of cancer in women are breast, lung and colorectal. The number of new cases is increasing due to an aging and growing population.

**Excluding Nonmelanoma Skin Cancer

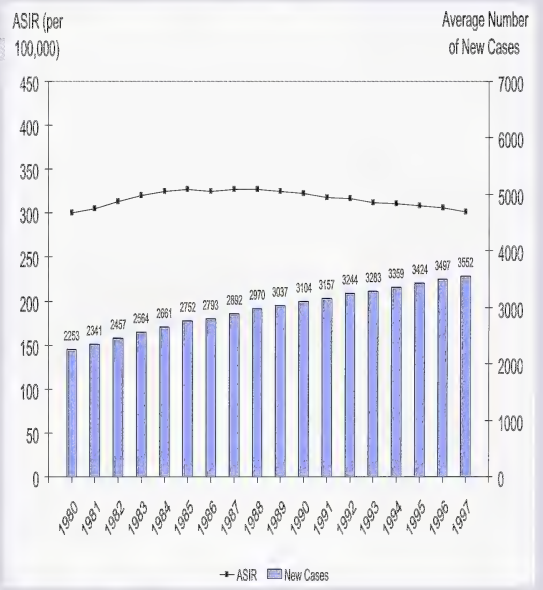
Age-Standardized Incidence Rates (ASIR) and New Cases for All Invasive Cancers**, Males, Alberta (1980-1997)*

Including Prostate Cancer



*Three year moving averages

Excluding Prostate Cancer



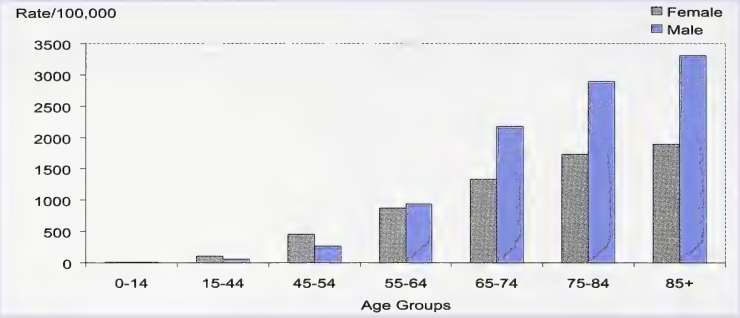
*Three year moving averages

In order to understand overall trends better, prostate cancer, which accounted for 28% of all invasive cancers in males in 1997, has been excluded from the second graph above. Prostate cancer incidence rates were inflated by the introduction of PSA testing in the late 1980s, but this increase in rates has not been sustained. After prostate cancer, the second and third most common types of cancer in men are lung and colorectal.

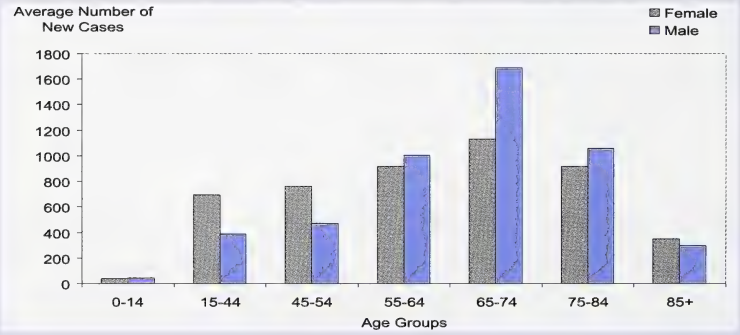
Both graphs indicate that age-standardized rates of cancer incidence in men have declined in the last few years. However, in spite of the decline in incidence rates, the number of new cases is increasing due to an aging and growing population.

**Excluding Nonmelanoma Skin Cancer

Age-Specific Incidence Rates for All Invasive Cancers, Alberta 1997 (average of 1996-1998)*



New Cases by Selected Age Groups for All Invasive Cancers, Alberta 1997 (average of 1996-1998)*

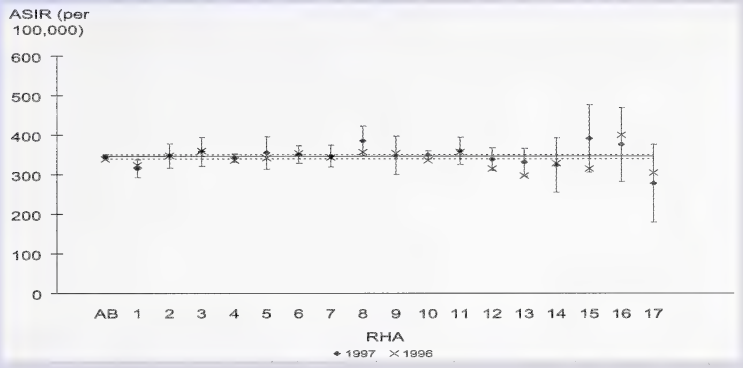


The age-specific incidence rates show a sharp increase with age, particularly in men. However, the number of new cancer cases drops off after age 75 for men and women. Note that the age-specific incidence rates are generally higher for men than for women after age 64.

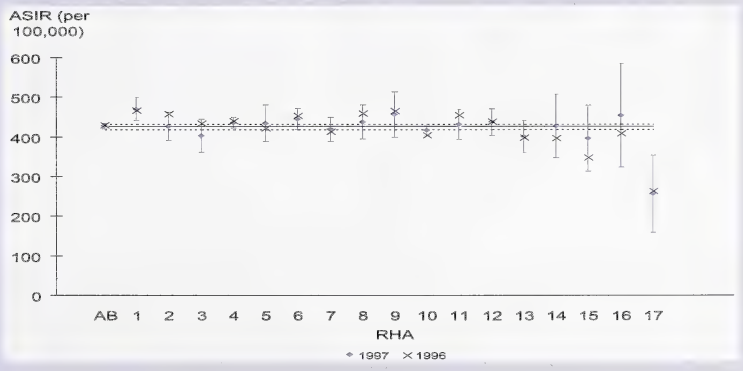
*Excluding Nonmelanoma Skin Cancer

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for All Invasive Cancers, 1997 (average of 1996-1998)*

Females



Males



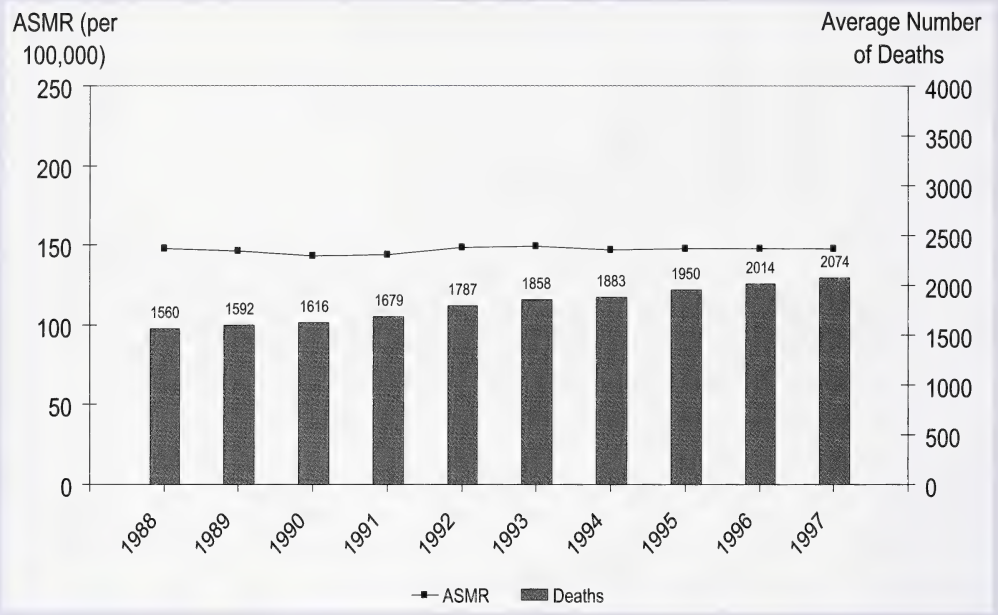
For females age-standardized incidence rates vary only slightly year over year for almost all RHAs.

For males there is some variation among RHAs (especially among RHAs with smaller populations), but even with age standardization, small numbers may result in erratic estimates. This pattern will be monitored to see if it continues over a number of years.

*Excluding Nonmelanoma Skin Cancer

ALL CANCERS - MORTALITY

Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for All Invasive Cancers, Females, Alberta (1988-1997)

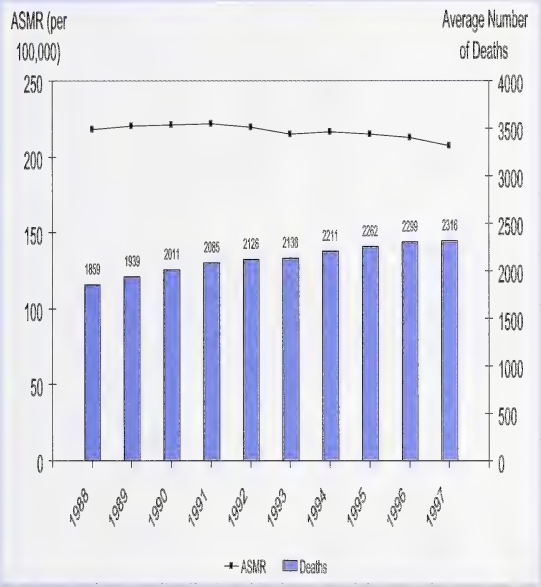


*Three year moving averages

The age-standardized mortality rates in women have been relatively stable. As you will see later in this document, for women, large increases in lung cancer mortality rates have been offset by declining or stable rates for most other forms of cancer.

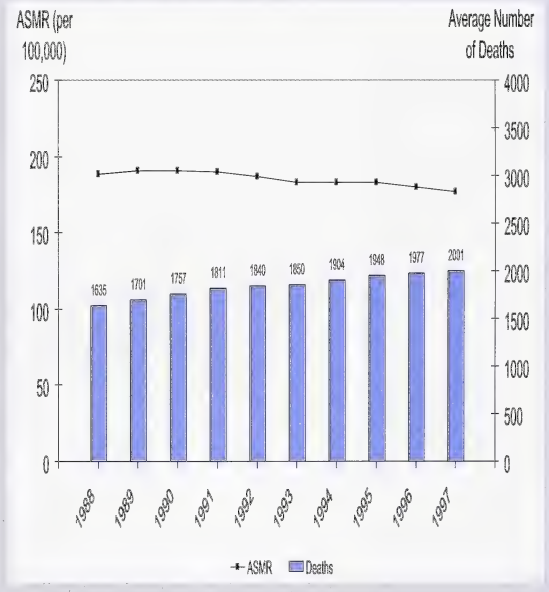
Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for All Invasive Cancers, Males, Alberta (1988-1997)*

Including Prostate Cancer



*Three year moving averages

Excluding Prostate Cancer

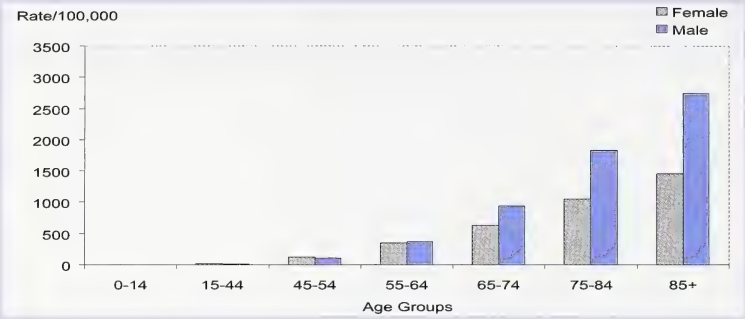


*Three year moving averages

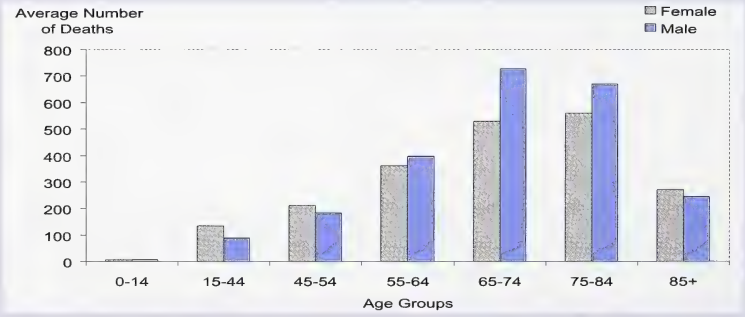
Mortality rates in men (including prostate cancer) have decreased slightly from 217 deaths per 100,000 in 1988 to 207 deaths per 100,000 in 1997. Mortality rates in men (excluding prostate cancer) have decreased from 188 deaths per 100,000 in 1988 to 177 deaths per 100,000 in 1997. Prostate cancer accounted for approximately 14% of cancer deaths in men in 1997.

The increase in incidence rates of prostate cancer in the early 1990s has not been reflected in an increase in mortality rates due to prostate cancer. Hence the trends in both graphs above are similar.

Age-Specific Mortality Rates for All Invasive Cancers, Alberta 1997 (average of 1996-1998)*



Number of Deaths by Selected Age Groups for All Invasive Cancers, Alberta 1997(average of 1996-1998)*

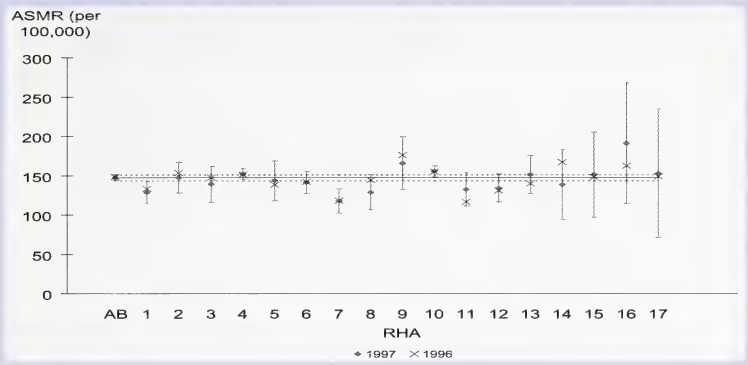


The age-specific mortality rates show a sharp increase with age, particularly in men. However, the number of cancer deaths drops off after age 75 for men and after age 85 for women. This is because there is a smaller population in the older age groups, as people die of other causes.

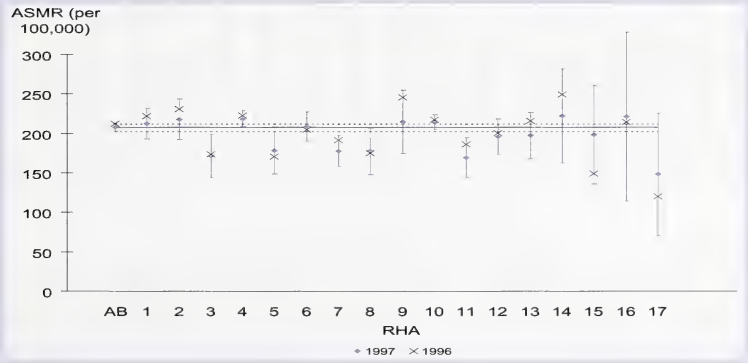
*Excluding Nonmelanoma Skin Cancer

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CI), All Invasive Cancers, 1997 (average of 1996-1998)*

Females



Males

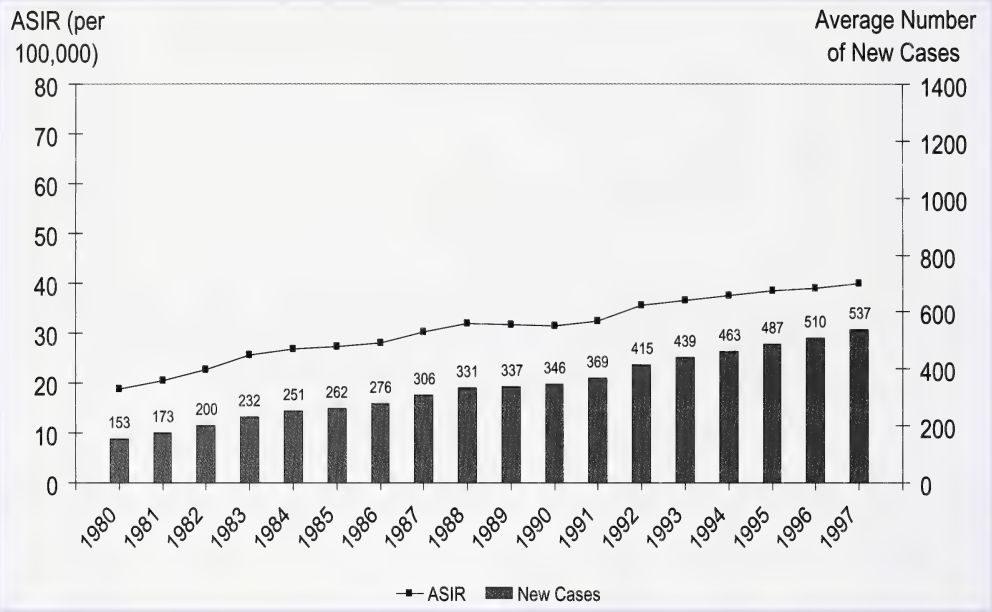


Similar to cancer incidence, there is very little variation in cancer mortality among the RHAs for females. There is some variation among RHAs for males (especially among RHAs with smaller populations), but even with age standardization, small numbers may result in erratic estimates. Patterns will be monitored to see if they continue over a number of years.

*Excluding Nonmelanoma Skin Cancer

LUNG CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Lung Cancer, Females, Alberta (1980-1997)



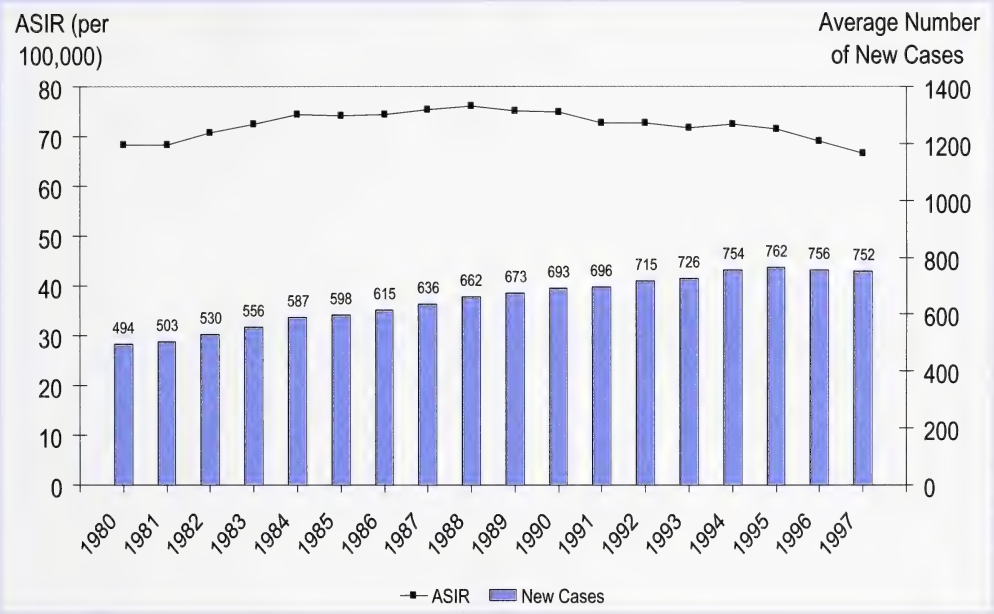
*Three year moving averages

Lung cancer incidence rates in females have increased substantially over the last two decades. The number of female lung cancer cases in 1997 is 3.5 times higher than the number of cases in 1980. The rising trend in lung cancer incidence in females reflects their increase in smoking behavior 20 to 30 years ago.

Alberta women's rates of smoking peaked in 1966 at 30% followed by a dramatically increased rate of lung cancer from 19 per 100,000 in 1980 to 40 per 100,000 in 1997.[1] In 1999, 25% of Alberta women, age 15 and over were smokers.[2] Although the prevalence of smoking amongst Alberta women has decreased by two percent since 1996, female lung cancer rates can be expected to continue to increase[3] as a result of past smoking behaviors.

1 Health and Welfare Canada, *Smoking Habits of Canadians 1965-1979* (Ottawa, 1980) 21.
2 Health Canada, *Canadian Tobacco Use Monitoring Survey,* (Ottawa, February - December 1999) Table 3.
3 Health Canada, *National Population Health Survey Highlights 1996/97* (Ottawa, 1999).

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Lung Cancer, Males, Alberta (1980-1997)*



*Three year moving averages

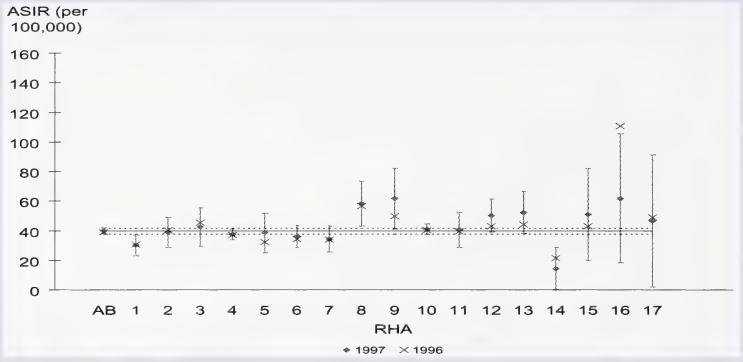
The declining trend in lung cancer incidence in males reflects their decrease in smoking prevalence 20 to 30 years ago. In 1966, 47% of Alberta males were smokers compared to 36% in 1979.[1] The age-standardized incidence rate of lung cancer in males dropped from 77 per 100,000 in 1988 to 66 per 100,000 in 1997. Note, however, that the number of cases and the rates are still substantially higher than in women.

Prevalence of smoking amongst Alberta men dropped by four percent between 1996 and 1999, from 31% to 27%.[2] This decrease in smoking should be reflected in falling incidence rates of lung cancer in the years to come. However, further reductions in smoking rates would further the decline in lung cancer incidence.

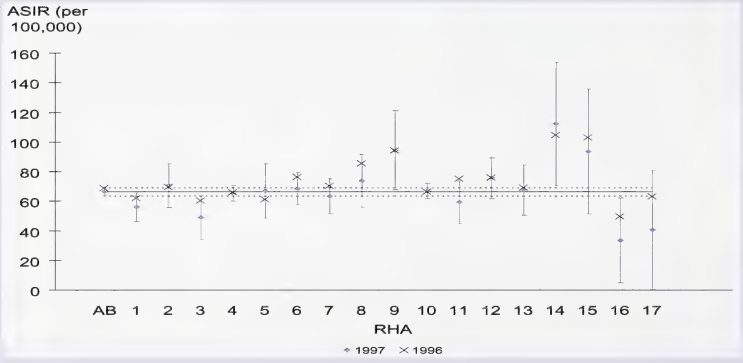
1 Health and Welfare Canada, *Smoking Habits of Canadians 1965-1979* (Ottawa, 1980) 20.
2 Health Canada, *National Population Health Survey Highlights 1996/97* (Ottawa, 1999).

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Lung Cancer, 1997 (average of 1996-1998)

Females



Males



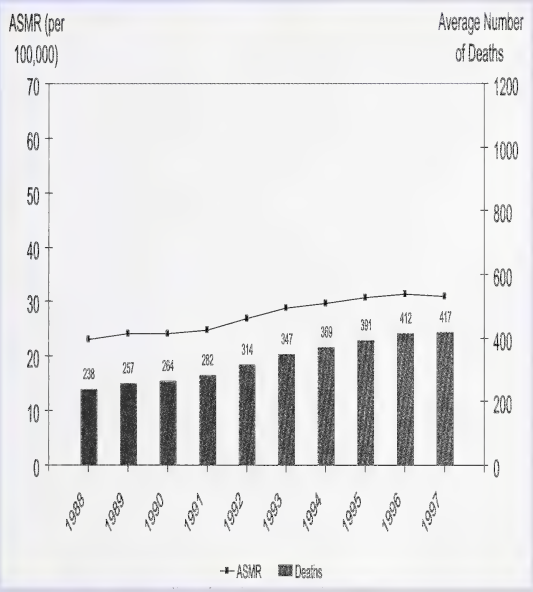
There is variability in lung cancer incidence among the smaller RHAs, but note the large confidence intervals. Since lung cancer incidence is related to smoking patterns, the variation of rates may be a reflection of past smoking patterns.

Similar to the age-standardized incidence rates by RHA for all invasive cancers, there is slightly more variation for males than females (especially among smaller RHAs).

LUNG CANCER - MORTALITY

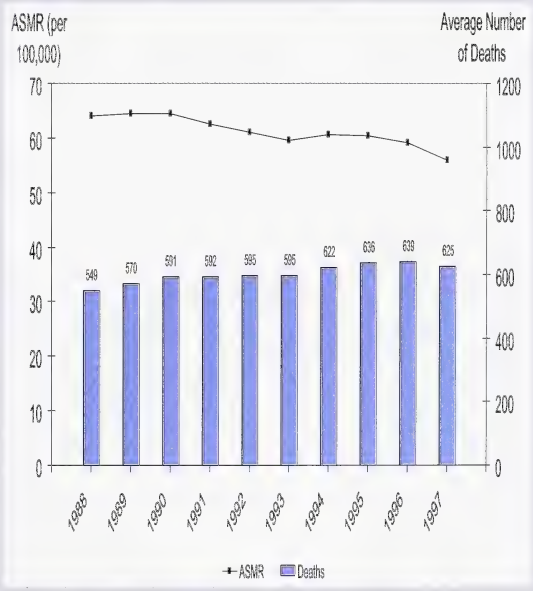
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Lung Cancer, Alberta (1988-1997)

Females



*Three year moving averages

Males



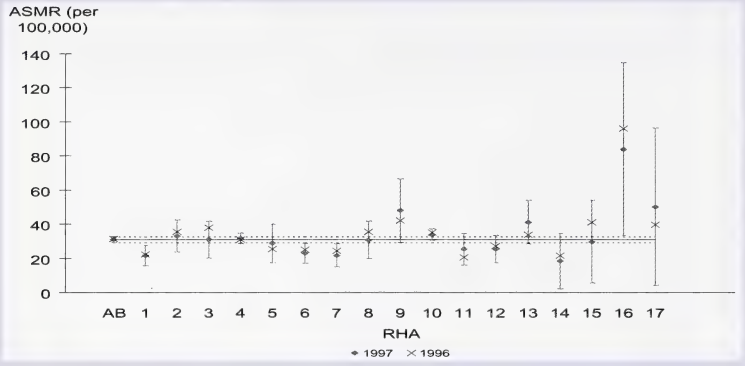
*Three year moving averages

The mortality trends for lung cancer for both females and males are very similar to their corresponding incidence trends. Lung cancer still has quite a high death rate; therefore the number of deaths per year is almost as high as the number of new cases. Note that even though male mortality rates are falling they are still higher than female mortality rates.

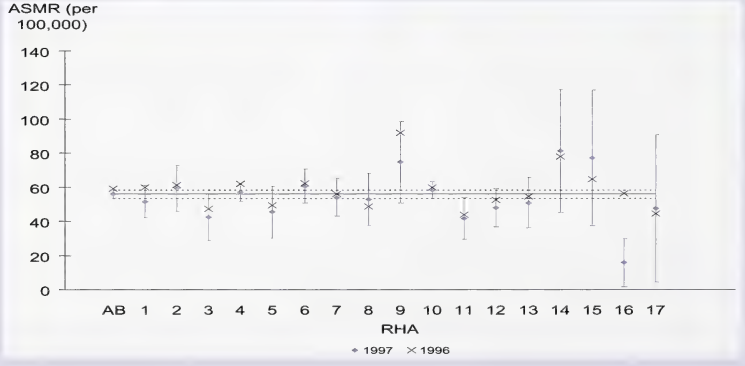
Since 1994, lung cancer has accounted for more deaths in Alberta women than breast cancer.

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CIs) for Invasive Lung Cancer 1997 (average of 1996-1998)

Females



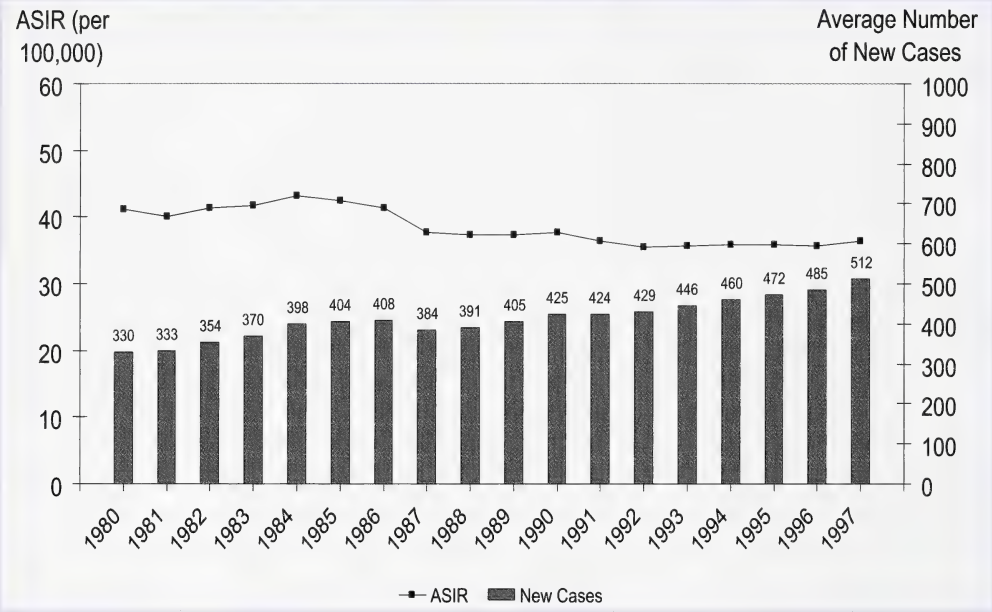
Males



The patterns of the RHA age-standardized mortality rates for lung cancer are similar to the age-standardized incidence patterns.

COLORECTAL CANCER - INCIDENCE

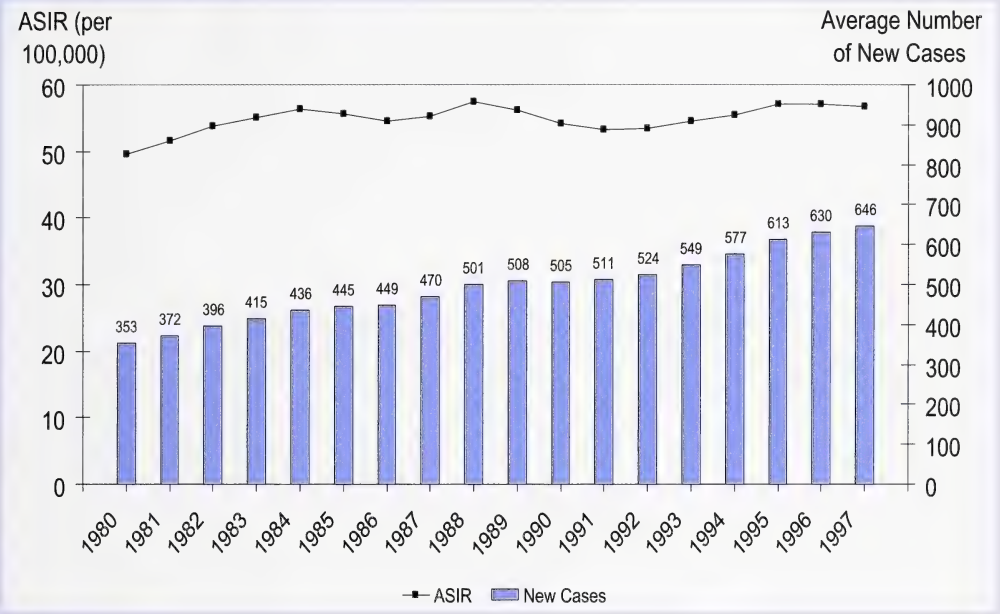
Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Colorectal Cancer, Females, Alberta (1980-1997)



*Three year moving averages

The age-standardized incidence rates for colorectal cancer in females shows a gradual downward trend between 1980 and 1992 and remained relatively stable thereafter. The reasons for changes in trends in colorectal cancer incidence are not well understood, but some evidence suggests that lifestyle changes such as diet may have contributed to the decline.

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Colorectal Cancer, Males, Alberta (1980-1997)*

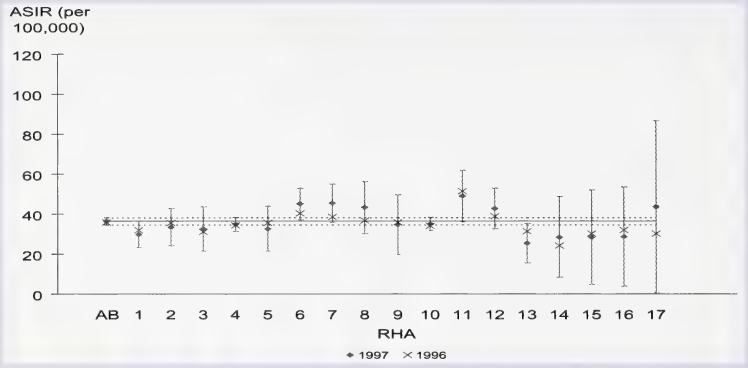


*Three year moving averages

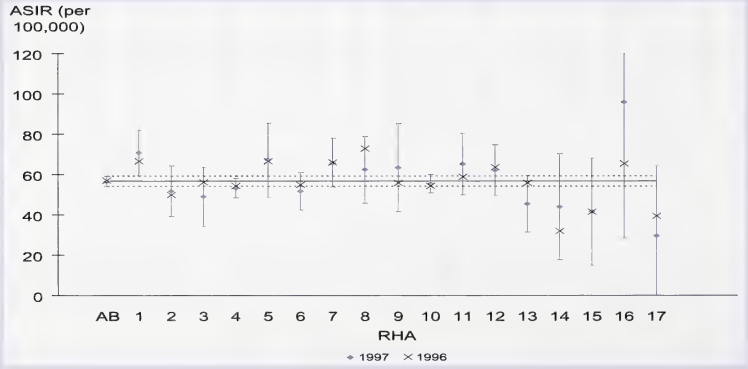
The age-standardized incidence rates for colorectal cancer in males did not show the same downward trend as female rates between 1980 and 1997, although male rates have been fairly stable since 1995. The reasons for the difference between male and female rates are not well understood.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Colorectal Cancer 1997 (average of 1996-1998)

Females



Males

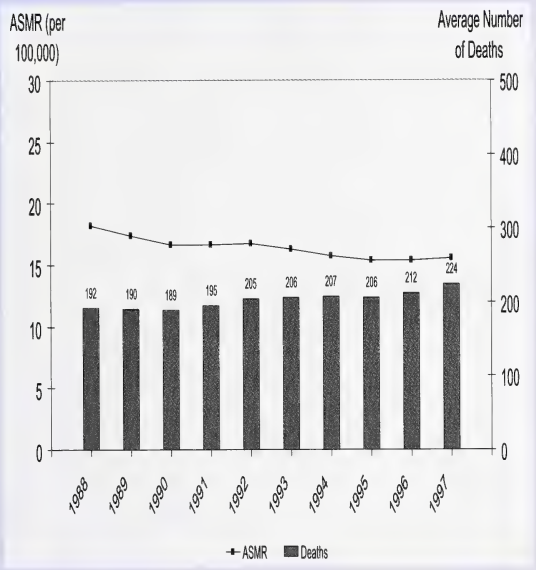


Female rates for colorectal cancer are quite comparable across RHAs, while the rates for males are more variable. Note that all confidence intervals include the provincial average.

COLORECTAL CANCER - MORTALITY

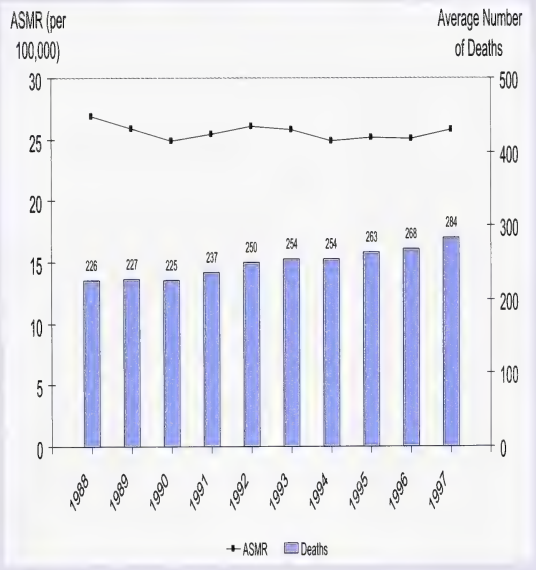
Age-Standardized Mortality Rates (ASMR) and the Number of Deaths for Invasive Colorectal Cancer, Alberta (1988-1997)*

Females



*Three year moving averages

Males



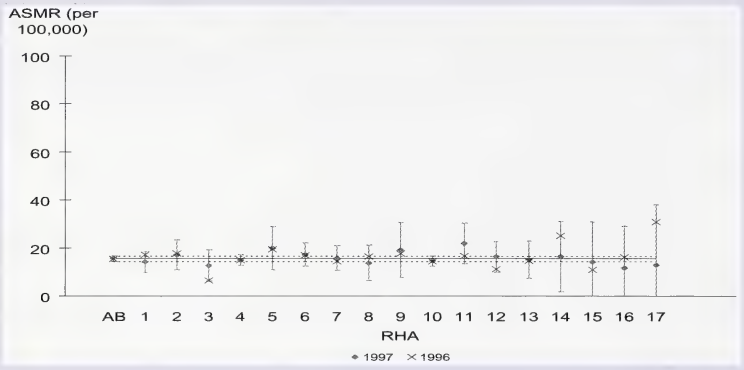
*Three year moving averages

Female age-standardized mortality rates reflect the declining pattern of female incidence rates, whereas male mortality rates have fluctuated over the time period.

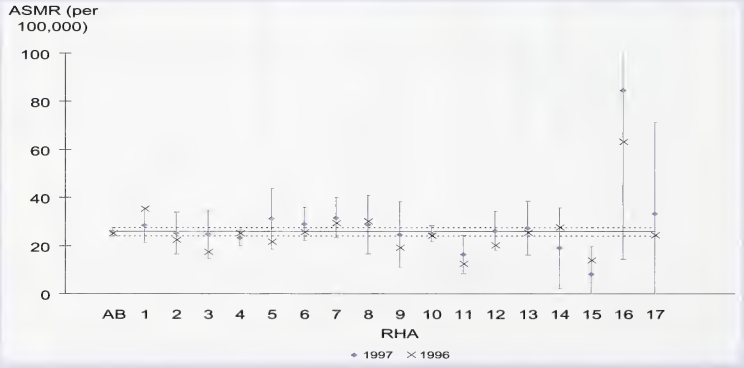
Male mortality rates continue to be higher than female rates. The age-standardized mortality patterns from colorectal cancer are similar to those for incidence. However, the number of deaths that occur in a given year is approximately 45% of the number of new cases.

Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CIs) for Invasive Colorectal Cancer 1997 (average of 1996-1998)

Females



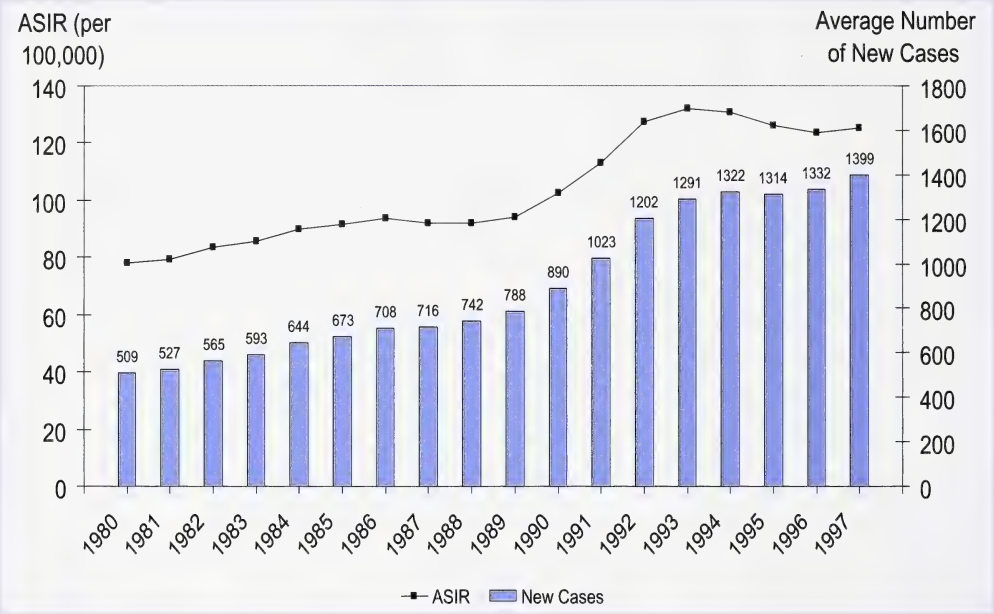
Males



There is little variability across the RHAs in the age-standardized mortality rates among men and women.

PROSTATE CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Prostate Cancer, Males, Alberta (1980-1997)

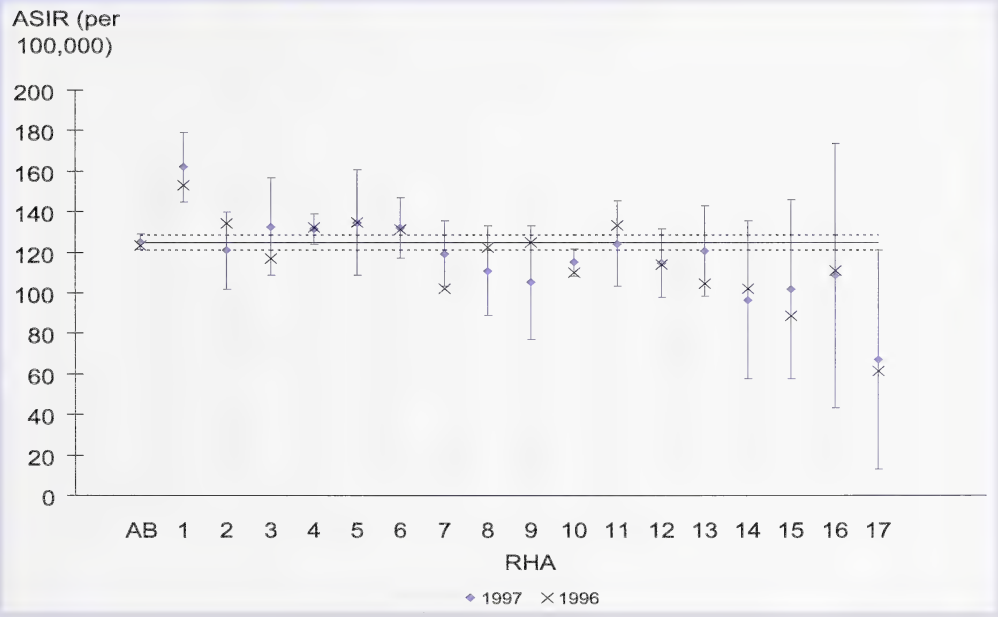


*Three year moving averages

Increased incidence of prostate cancer prior to 1990 is partly due to increased detection of cancers following trans-urethral resection of the prostate (TURP) for suspected benign prostatic hypertrophy.

The sharp increase since 1990 is predominantly the result of increased early detection using PSA (prostate specific antigen) testing, which became available in Alberta in 1989. The testing resulted in early detection of clinically unsuspected cancers, advancing the time of diagnosis. This pattern is seen throughout Canada. This trend will continue to be monitored over a number of years.

Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Prostate Cancer, Males 1997 (average of 1996-1998)

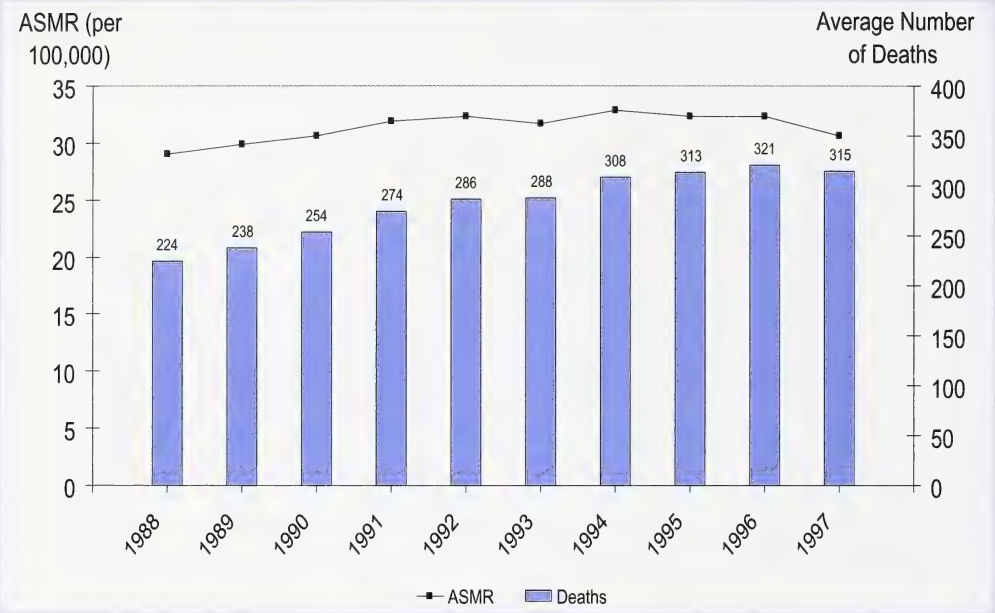


As in 1996, the 1997 incidence rates are generally higher in the south RHAs and lower in the north RHAs. This may reflect different patterns of PSA testing in the province, but other explanations are also possible.

Prostate cancer incidence has changed dramatically since 1990 and this is believed to be because of the influence of PSA testing as discussed on page 26. Trends will continue to be monitored by the Alberta Cancer Registry.

PROSTATE CANCER - MORTALITY

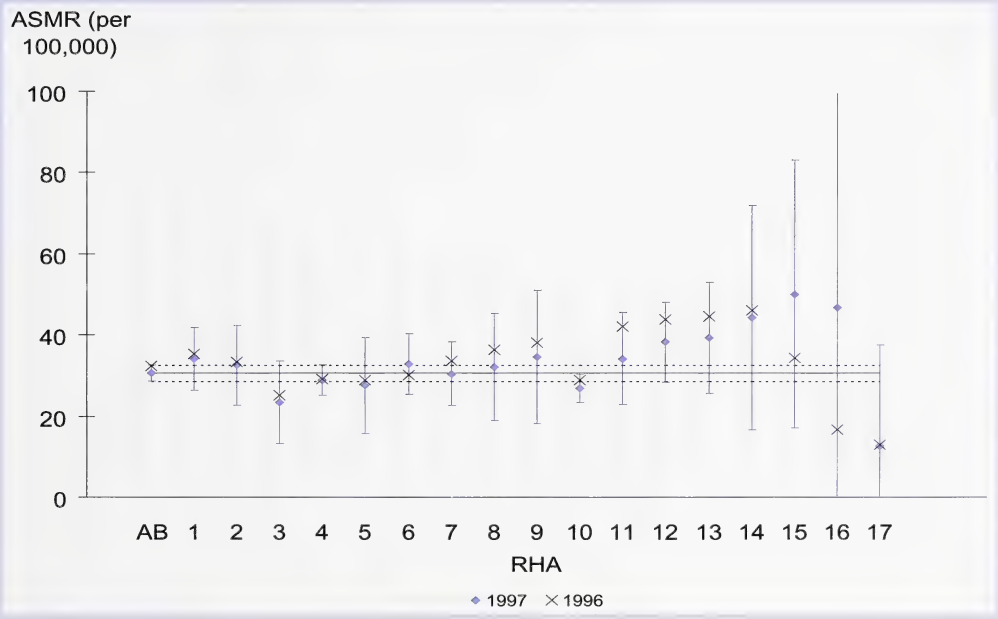
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Prostate Cancer, Males, Alberta (1988-1997)



*Three year moving averages

Despite the sharp increase in prostate cancer incidence from 1990-1993, there has not been an associated increase in mortality rates. Age-standardized mortality rates have been relatively stable since 1990 although the average number of deaths have gradually increased since that time.

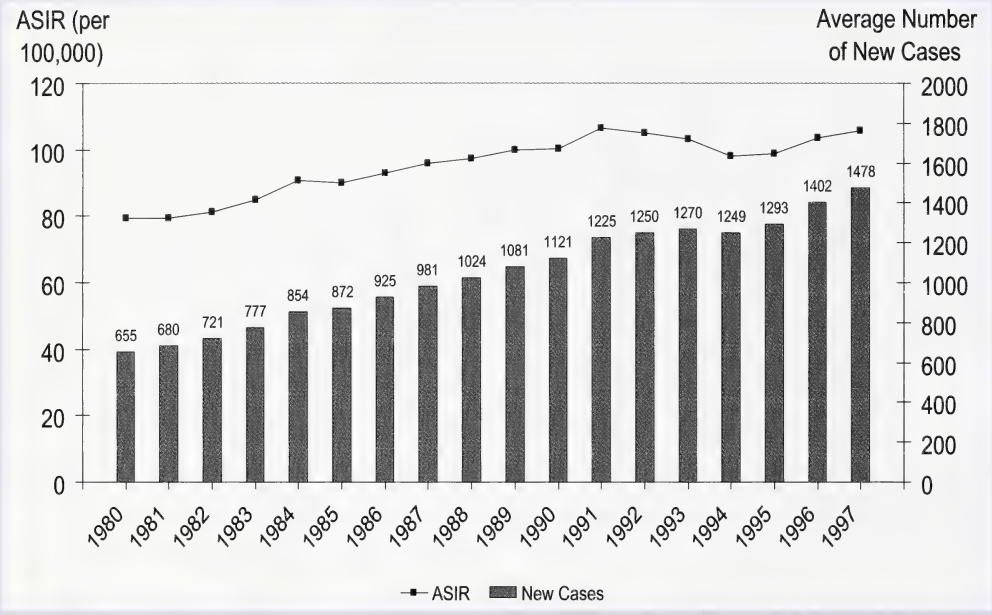
Age-Standardized Mortality (ASMR) Rates by RHA with 95% Confidence Intervals (CIs) for Invasive Prostate Cancer, Males 1997 (average of 1996-1998)



There is little variation across RHAs in mortality rates, in contrast to the variability in incidence rates. This adds strength to the suggestion that the higher incidence in some areas may be due to differences in detection patterns.

BREAST CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Breast Cancer, Females, Alberta (1980-1997)

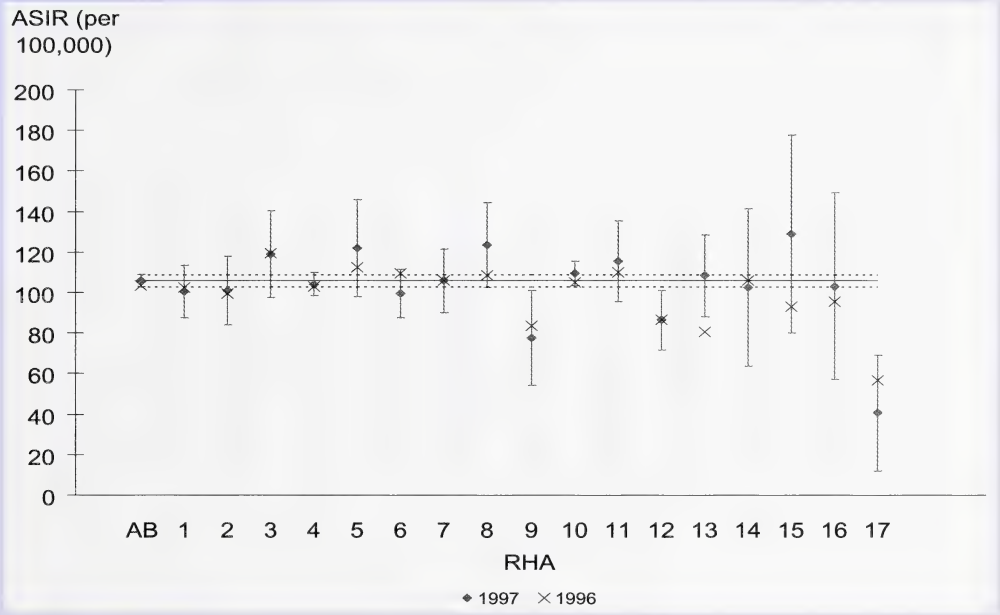


*Three year moving averages

Incidence rates for breast cancer steadily increased until the mid 1990s when the rates began to stabilize. The trend may reflect an increase in screening mammography that occurred in the late 1980s and early 1990s.

More cancers were found earlier through screening mammography than would have been previously detected. However, even without the effect of screening mammography there has been an underlying gradual increase in breast cancer incidence rates that goes back for many years. The reason for this is not well understood.

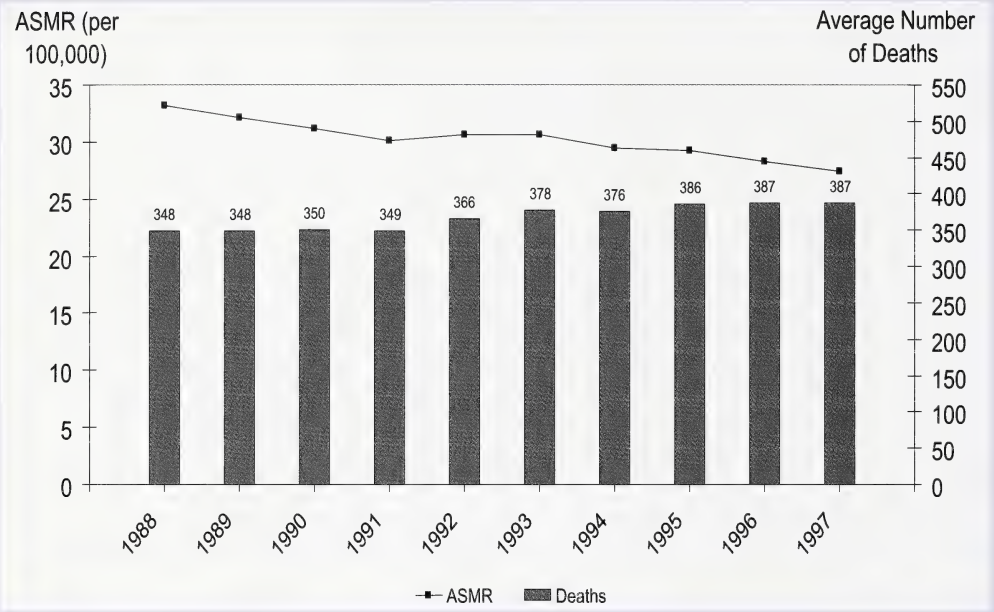
Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Breast Cancer, Females 1997 (average of 1996-1998)



There is some variability in breast cancer incidence among the RHAs with smaller populations, but note the large confidence intervals. Year to year variation is also more visible among the RHAs with smaller populations.

BREAST CANCER - MORTALITY

Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Breast Cancer, Females, Alberta (1988-1997)

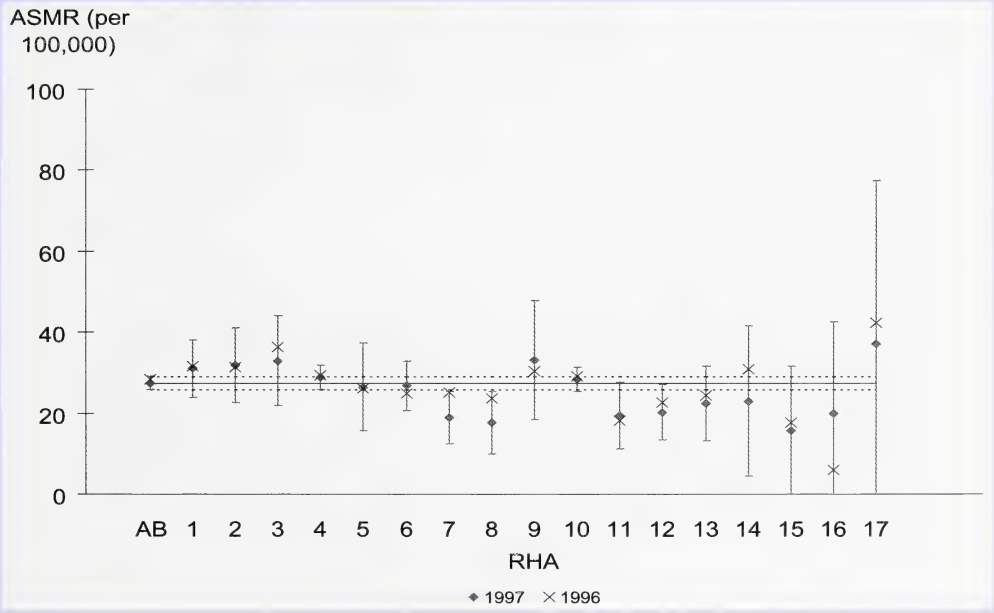


*Three year moving averages

Breast cancer mortality rates are gradually decreasing. Further research is needed to determine whether early detection through mammography screening, improved treatment or other factors are responsible for this decline.

The fact that incidence rates increased while mortality rates decreased reflects better survival for diagnosed cases. The survival rate is much higher for cancers found at an earlier stage.

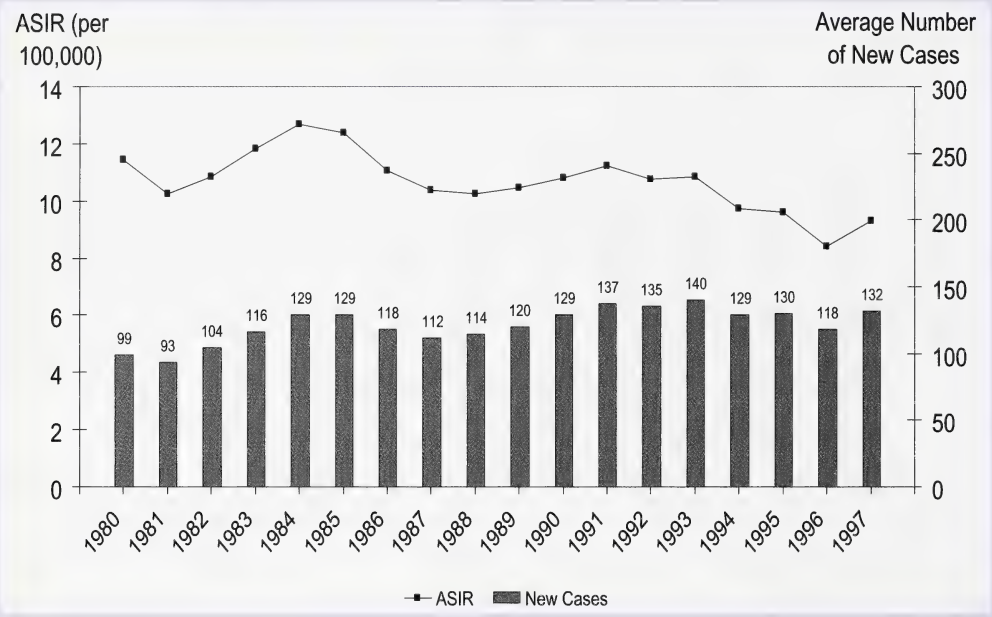
Age-Standardized Mortality Rates (ASMR) by RHA with 95% Confidence Intervals (CI) for Invasive Breast Cancer, Females 1997 (average of 1996-1998)



For 1997 there continues to be little variation of breast cancer mortality rates across the RHAs.

CERVICAL CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Cervical Cancer, Females, Alberta (1980-1997)

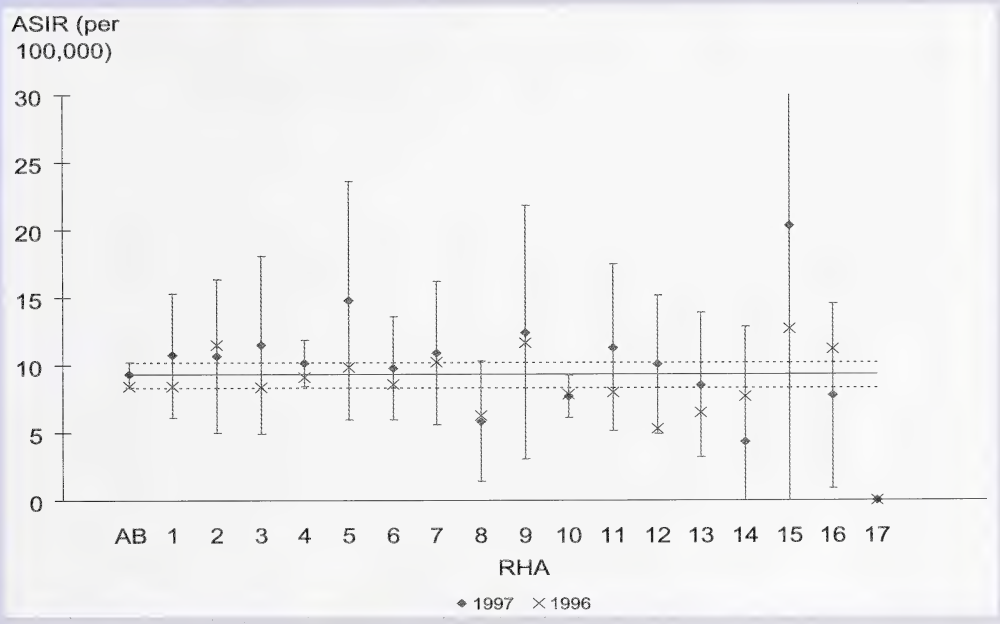


*Three year moving averages

Age-standardized incidence rates for cervical cancer have decreased slightly since the mid 1980s. Pap smear screening can actually prevent the incidence of invasive cervical cancer by detecting and effectively treating pre-cancers, and is likely responsible for most of the decrease. In 1997, over 130 cases of invasive cervical cancer were recorded. In addition, 1,518 cases of cervical carcinoma in-situ (lesions that have not spread beyond the surface of the cervix) were recorded.

An organized cervical cancer screening program could further reduce incidence rates by targeting women with lower screening rates. Planning for an organized cervical cancer screening program for Alberta began in 2000, with full implementation to occur over several years.

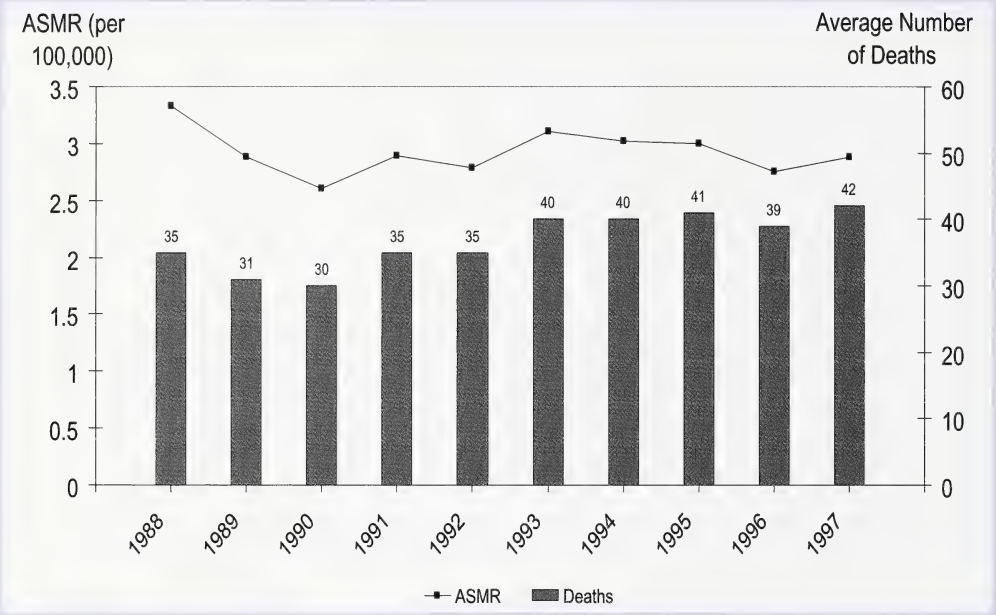
Age-Standardized Incidence Rates (ASIR) by RHA with 95% Confidence Intervals (CIs) for Invasive Cervical Cancer, Females 1997 (average of 1996-1998)



There continues to be little variation in cervical cancer incidence rates across the RHAs for 1997. Note that the RHAs that display slightly varied rates and large confidence intervals are those with a relatively small population.

CERVICAL CANCER - MORTALITY

Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Cervical Cancer, Females, Alberta (1988-1997)



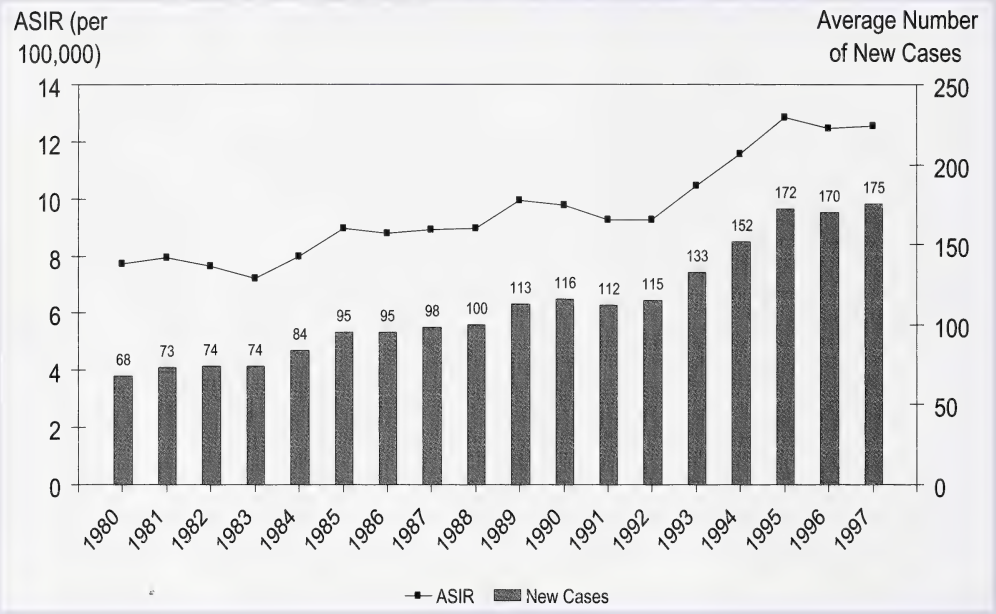
*Three year moving averages

Cervical cancer has a very good prognosis when detected and treated early; therefore the mortality rates are considerably lower than the incidence rates. Nonetheless, over 40 Alberta women died in 1997 from cervical cancer and many of those deaths could have been prevented.

Note that regional mortality rates are not presented for cervical cancer because of the small number of deaths.

MELANOMA - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Invasive Melanoma, Females, Alberta (1980-1997)



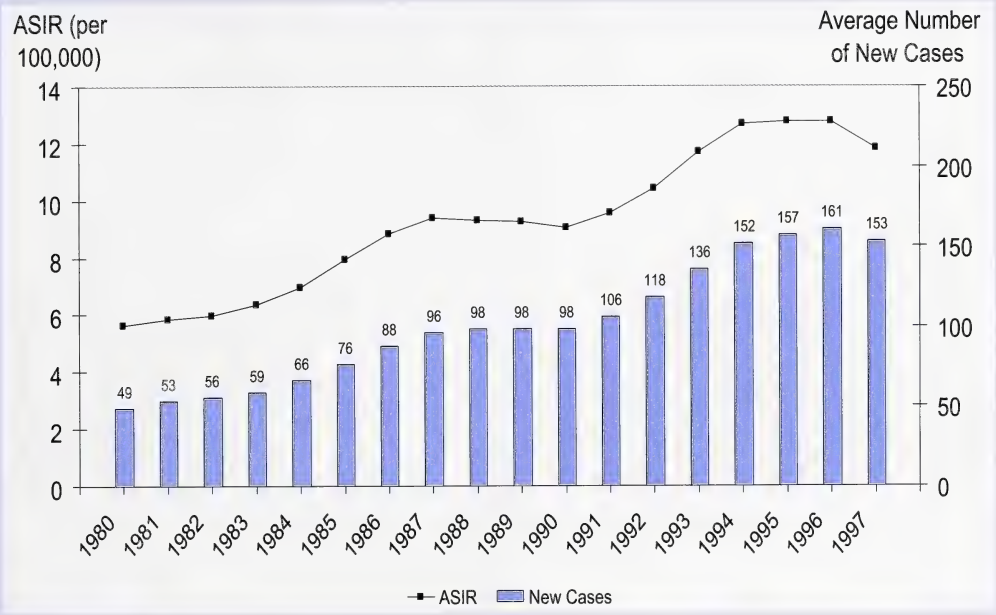
*Three year moving averages

Melanoma skin cancer showed a sharp increase from 1992-1995 but rates have since leveled off. The increase in incidence of this cancer could be largely due to a change in coding procedures. In 1993 the Alberta Cancer Registry adopted the NAACCR coding rules as developed by the SEER** program – this method of coding captured more cancers. The cancer rates stabilized in 1996 and 1997 as the effect of the 1993 coding changes leveled off.

Note that mortality data are not included for melanoma skin cancer. Even though it is by far the most serious form of skin cancer, the survival rate is very high when detected and treated early.

**SEER = Surveillance, Epidemiology, & End Results Program

Age-Standardized Incidence Rates (ASIR) and New Cases for Invasive Melanoma, Males, Alberta (1980-1997)*



*Three year moving averages

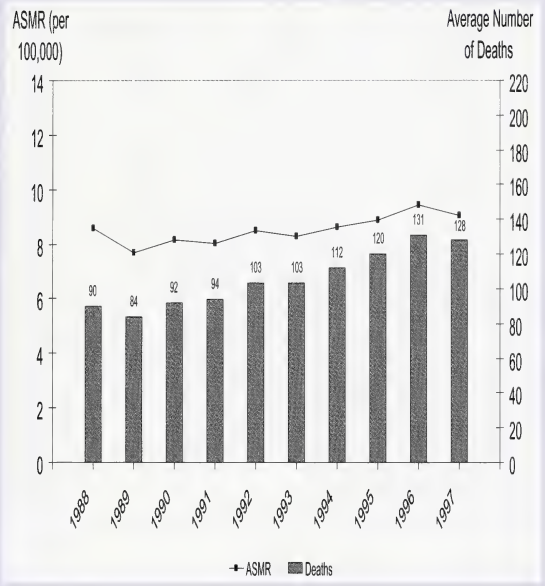
Melanoma shows a similar increase in incidence for males and females in the early 1990s. However in 1997, the three year average incidence rates dropped slightly for males while female incidence rates remained the same. In 1997, males had a three year average age-standardized incidence rate of less than 12 cases per 100,000 while females remained at 13 cases per 100,000.

An explanation for the trends in melanoma skin cancer can be found on the previous page.

PANCREAS CANCER - MORTALITY

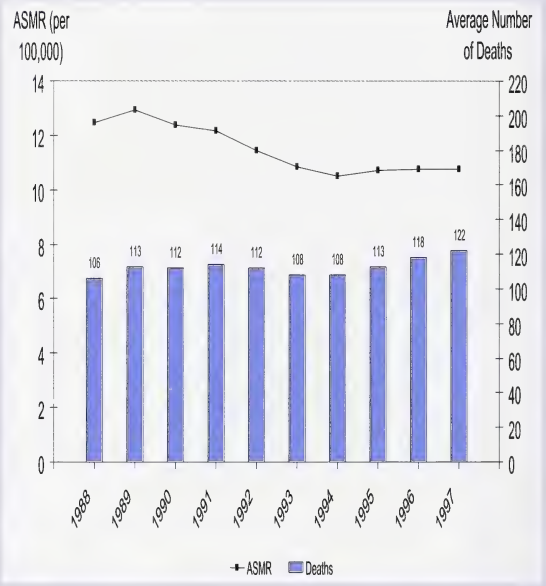
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Pancreas Cancer, Alberta (1988-1997)

Females



*3 year moving averages

Males



*3 year moving averages

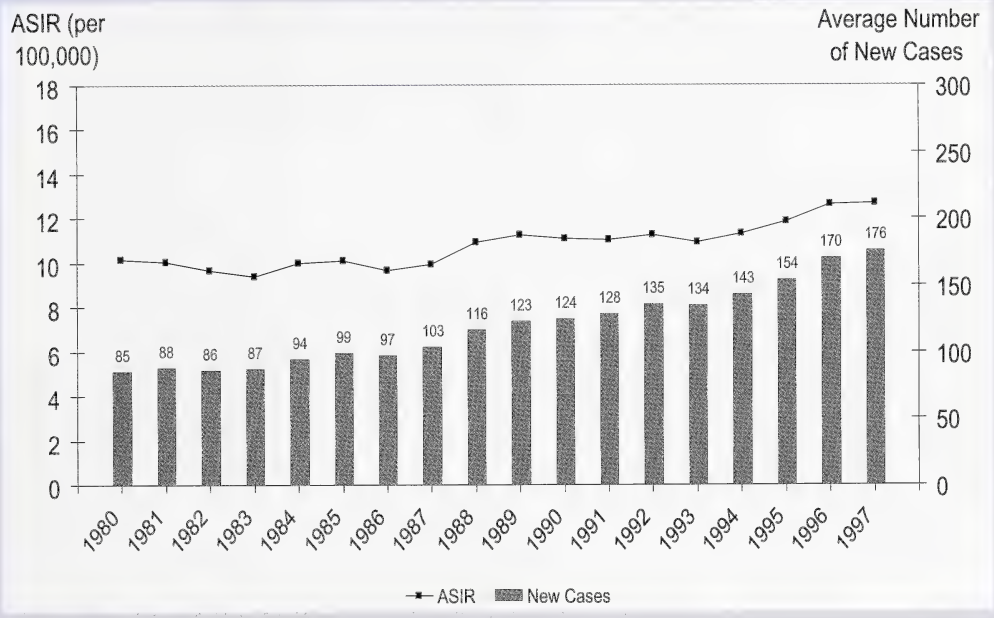
Incidence data are not included for cancer of the pancreas because mortality is almost identical to incidence. Mortality for cancer of the pancreas is gradually increasing in females while it is decreasing in males. Although this cancer accounts for only two percent of incident cancers, in 1998 it was the sixth leading cause of cancer deaths in Alberta due to its low survival rate. There is little variation in mortality rates for pancreatic cancer among the RHAs.

The only well-established risk factor of significance is smoking.[1] The cause for most cases of pancreatic cancer, however, is not known.

[1] Stephens, F. O., *The Increased Incidence of Cancer of the Pancreas*, Australian New Zealand Journal of Surgery. May 1999; 69(5) 331.

NON-HODGKIN'S LYMPHOMA - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Non-Hodgkin's Lymphoma, Females, Alberta (1980-1997)

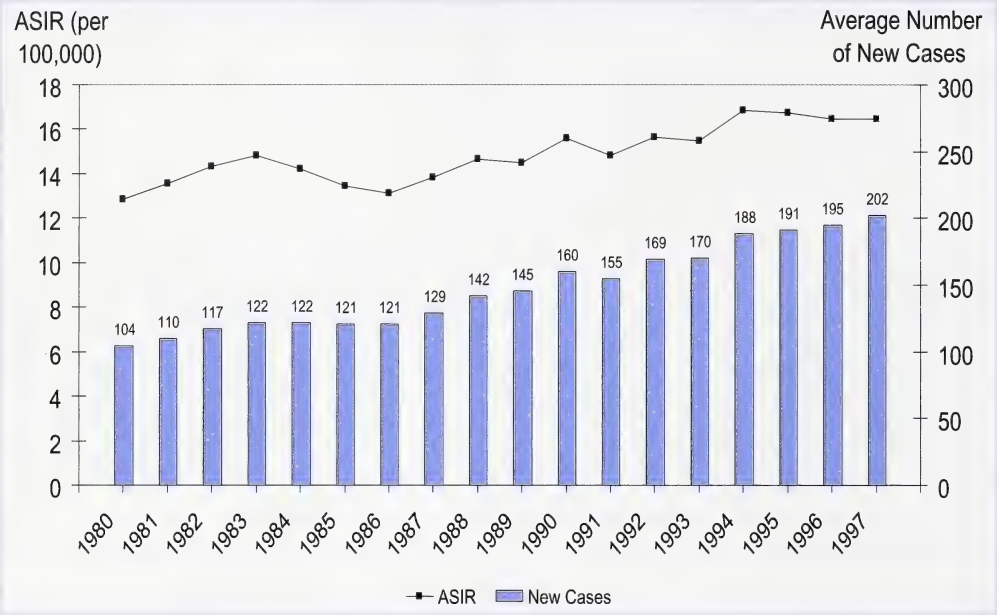


*Three year moving averages

Non-Hodgkin's lymphoma age-standardized incidence rates have been increasing in females. This is similar to the pattern seen in Canada as a whole. Little of the increase in non-Hodgkin's lymphoma can be explained by known viral or environmental risk factors[1].

[1] Camelos, George P., Andrew Lister and Jeffrey Sklar. *The Lymphomas* (Philadelphia: W.B.. Saunders Company, 1998) 58.

Age-Standardized Incidence Rates (ASIR) and New Cases for Non-Hodgkin's Lymphoma, Males, Alberta (1980-1997)*



*Three year moving averages

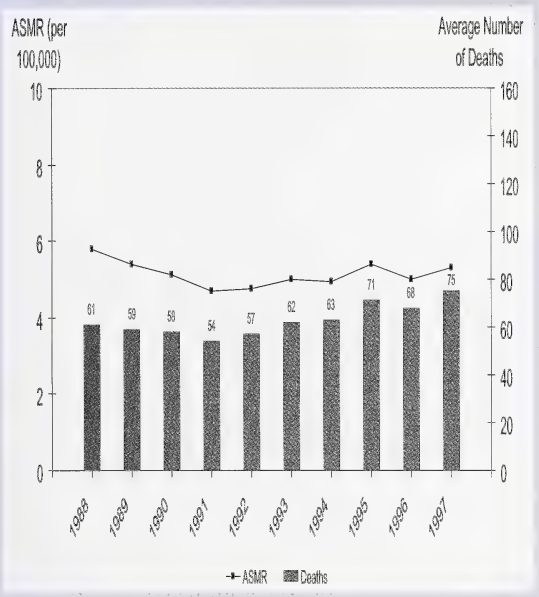
Non-Hodgkin's lymphoma age standardized incidence rates have been increasing in males. This is similar to the pattern seen in Canada as a whole. Males had a slightly higher rate of 17 cases per 100,000 in 1997 compared to 13 per 100,000 in females for the same year.

See the previous page for more explanation about the trends in Non-Hodgkin's lymphoma.

NON-HODGKIN'S LYMPHOMA - MORTALITY

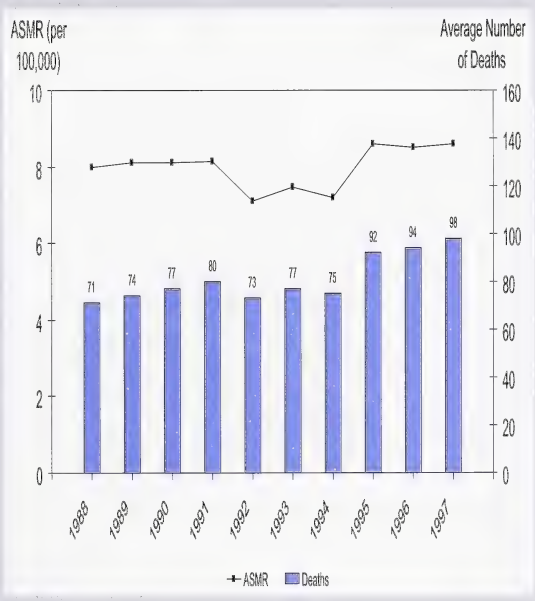
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Invasive Non-Hodgkin's Lymphoma, Alberta (1988-1997)

Females



*Three year moving averages

Males



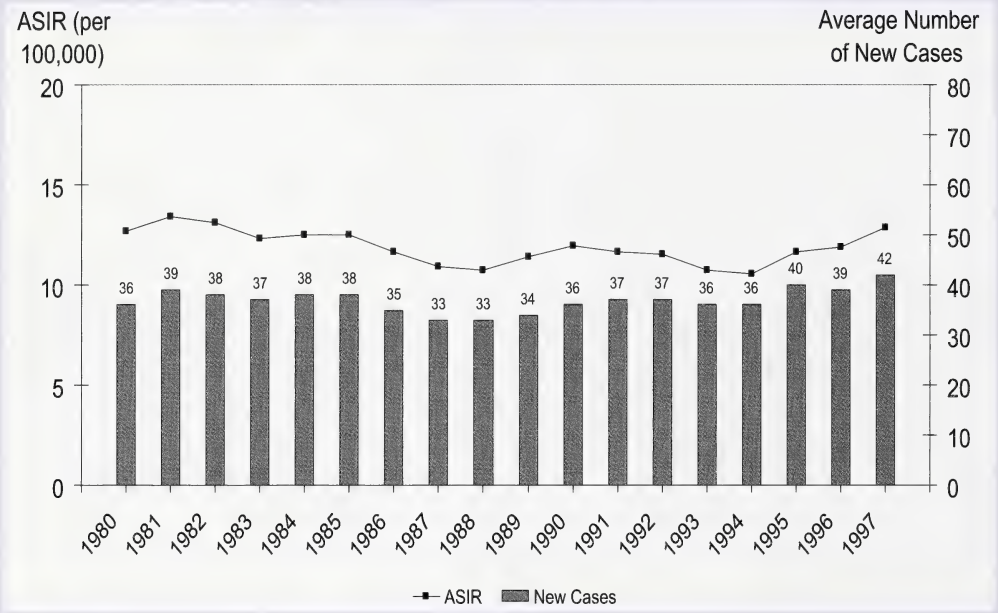
*Three year moving averages

Similar to age-standardized incidence rates, mortality rates are slightly higher for males than for females. In 1997, males had a mortality rate of 9 cases per 100,000 compared to 5 per 100,000 in females.

Although the mortality rates for Non-Hodgkin's Lymphoma for both males and females are low compared to other invasive cancers, the number of deaths that occur in a given year is 45 % to 50% of the number of new cases.

PEDIATRIC CANCER - INCIDENCE

Age-Standardized Incidence Rates (ASIR)* and New Cases for Pediatric Invasive Cancer (less than 15 years of age), Females, Alberta (1980-1997)

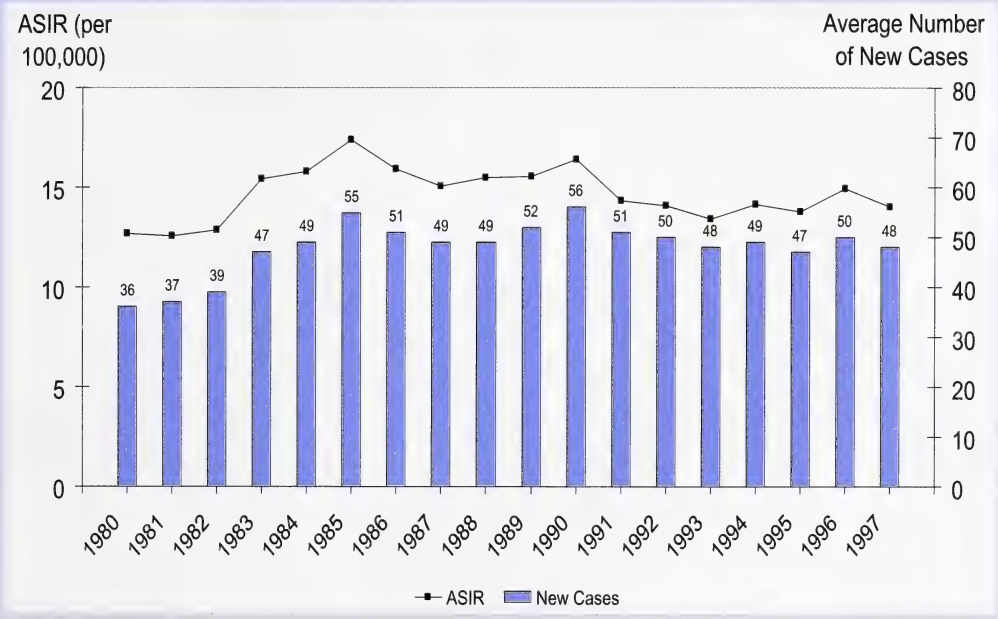


*Three year moving averages

Cancer is much less common in children than in adults. The types of cancer seen in children also differ from the common cancers in adults. The most common cancers in Alberta children are leukemia and lymphoma.

The causes of cancer in children and adults appear to differ. Lifestyle factors such as nutrition appear to play less of a role in pediatric cancer.

Age-Standardized Incidence Rates (ASIR) and New Cases for Pediatric Invasive Cancer (less than 15 years of age), Males, Alberta (1980-1997)*



*Three year moving averages

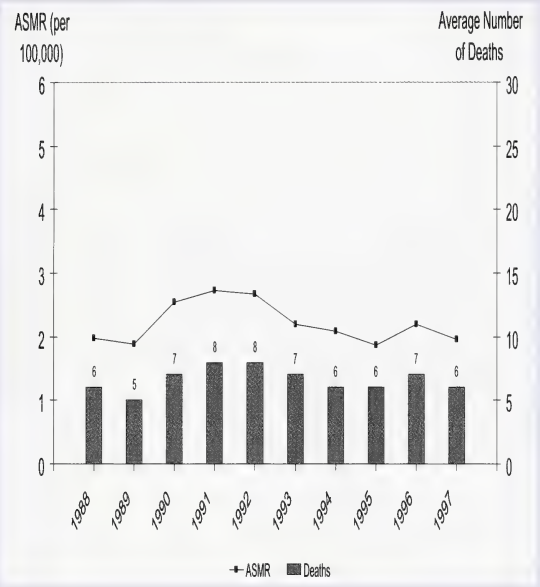
Pediatric invasive cancer occurs slightly more frequently among boys (14 per 100,000) than girls (13 per 100,000).

See the previous page for an explanation about pediatric invasive cancer.

PEDIATRIC CANCER - MORTALITY

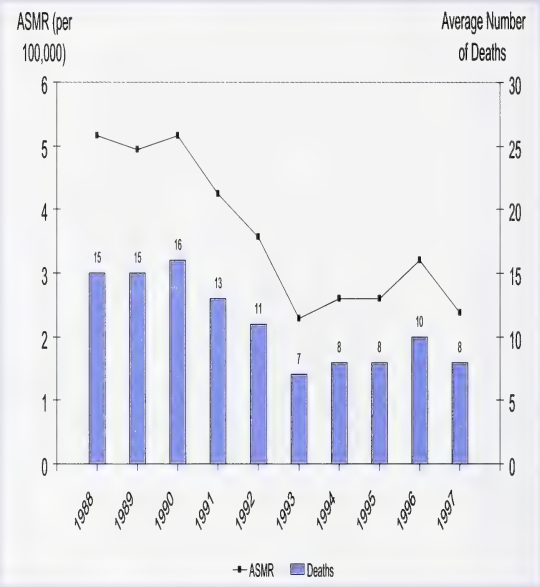
Age-Standardized Mortality Rates (ASMR)* and the Number of Deaths for Pediatric Invasive Cancer (less than 15 years of age), Alberta (1988-1997)

Females



*Three year moving averages

Males



*Three year moving averages

Many cancers in children are successfully treated. In 1997, 3 per 100,000 males and 2 per 100,000 females died from pediatric invasive cancer.** There is a high variability from year to year because the numbers are so small.

Over the past 20 years, there has been a marked improvement in survival for children with cancer, due to advances in treatment resulting from cancer research.

**Note that in the June 2000 Regional Picture report, mortality rates for pediatric invasive cancer were standardized to the entire population. In this report, mortality rates were standardized to the pediatric population only, which accounts for the increase in rates for both males and females year over year.

Technical Report

Data Preparation

The data for this report comes from the Alberta Cancer Registry. The Alberta Cancer Registry, of the Alberta Cancer Board's Division of Epidemiology, Prevention and Screening, records and maintains data on all new primary cancers and cancer deaths occurring in the province, as mandated by the Cancer Programs Act of Alberta. The Cancer Registry tries to capture all invasive and in situ cancers diagnosed amongst Albertans as well as borderline conditions and central nervous system tumours that have been seen at an Alberta Cancer Board facility.

The Alberta Cancer Registry, established in 1942, began compiling population-based data in 1950. However, due to consistent coding, data entry and data retrieval techniques, data starting from the 1970s are considered more reliable. At that time, the Registry became patient based, rather than tumour based.

The Alberta Cancer Registry operates out of two centres. The Calgary centre is responsible for the southern half of the province, while the Edmonton centre maintains data collection for the northern half of the province.

Sources of Data

Population

The population data for the provincial statistics used in this report (for the period of 1980-1997), were based on the Statistics Canada 1991 and 1996 Census, conducted every five years and are corrected for census undercounts.

Residence

All data in this report relate only to those people who were resident in Alberta at the time of diagnosis or death. The RHA of residence is determined primarily from the postal code. Alberta Health and Wellness has supplied a postal code - RHA conversion file (Feb 2000) for the most recent RHA boundaries. The Alberta Cancer Registry has also developed a conversion file of community name and RHA.

For incidence, the Standard Geographic Code or the Postal Code determines residence. Standard Geographic Code is available for 99.7% of cases and postal code for 98.3% of all cases registered (resident and non-resident).

For mortality, residence is determined from the death certificate. RHA of residence is defined from postal code and/or town of residence as recorded on the death certificate. Approximately 80% of death certificates have a postal code and only one or two cases per year are missing town. Where both postal code and town are recorded on the death certificate there is less than 0.5% disagreement on RHA designation. Agreement between postal code and town (where both are recorded) as to resident/non-resident of Alberta is almost 100%.

Incidence

Provincial incidence trends are averages presented for the period 1980-1997. The Alberta Cancer Registry learns of new cancers from a variety of sources. Laboratories throughout the province send a copy of each pathology report with a diagnosis of cancer to the nearest Alberta Cancer Board facility. The reports are then available to the Registry. Other items that also may be received are operative reports, discharge summaries and X-ray reports or scans.

All incidence tables and graphs represent new cancers and not the number of Albertans with cancer, as a person may have more than one type of cancer.

Mortality

Provincial mortality trends are averages presented for the period 1988-1997. Mortality data prior to 1988 are not presented because of problems with missing data on cause of death.

Alberta Vital Statistics sends the Registry an electronic file with a list of every death occurring in Alberta. These data are linked to the Registry to identify cancer cases that have died. Information on the date and cause of death is entered. Autopsy data, if different from the original diagnosis, is also entered. Cancer Registry staff may modify the death cause listed on the death certificate based on information available in the patient's medical record (see: 'Coding' section). Less than one percent of new cancer cases are registered through the death certificate only.

Regional Statistics

Regional statistics are based on an average of the most recent 3-year period (1996-98). The RHA specific rates are calculated with Alberta Health and Wellness population estimates using 1999 RHA boundaries from the Alberta Health and Wellness Registration files. The Alberta Health and Wellness population estimated for 1996 has less than 2 percent overall discrepancies from the Statistics Canada Census. The discrepancy is also less than 2 percent in each of the age groups with the exceptions of the 0-4 year and over 85-year age groups.

Coding

Methods for coding cancers have evolved over the years and continue to be refined. Cancers are currently coded according to the International Classification of Diseases for Oncology, second edition. (ICD0-2) which classifies all tumours by site and morphology. The primary site of incident cancers is the tissue or organ in which the cancer originates. In general, data are tabulated by a three-digit topography code with some exceptions. For certain morphologies such as lymphomas, classification by morphology takes precedence over topography.

It is possible for one individual to be diagnosed with more than one incident primary tumour, either at the same time or subsequently. The Alberta Cancer Registry follows the SEER rules for coding multiple primaries, which in general records separate primaries if the histology (sub) site or laterality is different from a previous cancer, or a new cancer is diagnosed more than 2 months after the initial diagnosis that is not stated to be recurrent or metatastic. SEER (Surveillance, Epidemiology and End Results Program) is a program of the United States National Cancer Institute that collects and publishes cancer incidence and survival data from population-based cancer registries. NAACCR (North American Association of Central Cancer Registries), in which the Alberta Cancer Registry is an active member, supports the use of SEER coding rules for multiple primaries.

Microscopic examination of tissues or cells is the definitive diagnostic test for cancer. During the period 1979-1997 93% of all cancers registered in the Alberta Cancer Registry were microscopically verified. In particular 98% of breast cases, 95% of prostate cases, 88% of lung cases and 96% of colorectal cancer cases were microscopically confirmed.

The completeness of case ascertainment may be estimated by an index derived from the ratio of the age-standardized incidence to mortality rates. For 1991-1995 relative to the combined SEER registries, the relative completeness of the Alberta Cancer Registry was estimated to be approximately 95%.

The underlying cause of death is coded according to the 9th edition of the International Classification of Disease (ICD-9). Data are tabulated by three-digit codes.

The Alberta Cancer Registry reviews the underlying and contributing cause(s) of death for all Albertans with a mention of cancer on the death certificate. If the cause of death is inconsistent with the person's last known condition further information is requested. Based on this information the underlying cause of death is reviewed and may be coded on the Registry as different from that appearing on the death certificate. In 1997, approximately 85% of deaths had the same ICD9 3 digit code, 5.4% were deemed to be in the same site (e.g. head and neck), and 3.1% were coded as primary unknown on one source and specific site on the other. In only 6% of deaths was there significant disagreement.

Statistical Methods

Average Number of New Cases

Average numbers of cases and deaths are plotted to describe the trends in the total burden of cancer and also reflect the changes in population structure.

Age-Specific Rates

Age-specific rates are calculated by dividing the number of incident cases or deaths occurring in a given calendar period, in a given age group for a particular sex by the corresponding age, sex specific Alberta population for the calendar period. Age-specific rates are expressed per 100,000 person years and reflect the relative changes in the underlying rates.

Age-Standardized Rates

Age-standardized incidence and mortality rates are presented because rates vary with age and if the crude rates [total number of cancer cases/(total population x period of observation)] are used for comparison purposes, they will be affected by differing population age structures. Age-standardized rates estimate the average cancer incidence rate that would have occurred in a standard population if the actual age-specific rates within that region had prevailed in the standard population. To compare cancer incidence rates over time, or with other geographic areas, all rates to be compared should be standardized to the same standard population. The 1991 Canadian Census population is used as the standard population in the calculation of the age-standardized cancer incidence and mortality rates in this document.

Three-Year Moving Averages

In all plots of trend over time, three-year moving averages are used to smooth out the effects of random year-to-year variation. These are calculated by averaging the numbers or rates over three year periods centred on a given year. Moving averages are presented for 1980-1997 for incidence, and for 1988-1997 for mortality.

Data from 1979-1998 are included for incidence and from 1987-1998 for mortality, because of the use of three year moving averages. The shorter period is used for mortality because the quality of the pre 1987 mortality data is not adequate for analysis.

Confidence Intervals (CIs)

A confidence interval (CI) is indicative of the precision of the estimate and in these data is mainly a reflection of the population size on which the estimate is based, and not on the quality of the data collected.

Survival Curves

The survival curves presented are cause-specific survival curves. The Alberta Cancer Registry routinely collects cause of death information. Cases were censored either at the date they left the province, at the date of death if death was not due to the cancer being analysed, or on March 31, 1999 for cases still alive.

Nonmelanoma Skin Cancer (NMSC)

Approximately 30 percent of malignant cancer cases diagnosed each year amongst Albertans are NMSC. There are specific rules for collecting NMSC that under-represent the true number of cases diagnosed each year, therefore they are not included in the incidence rates for All Cancers. Although these tumours are malignant, they are not typically life threatening and are usually successfully treated in doctors' offices without a pathology review.

Cancer in Alberta

A Regional Picture

Regional Data

In

Pocket

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